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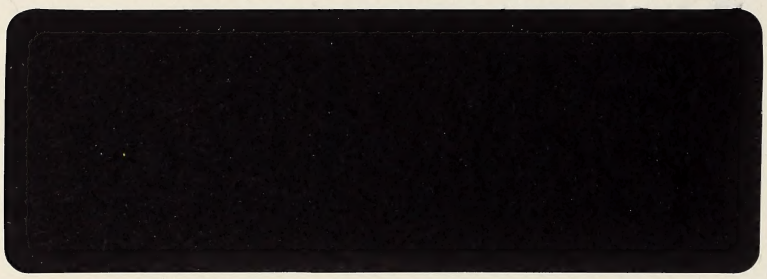
CELLULOSE INSULATION AS AN AIR BARRIER

Alberta
MUNICIPAL AFFAIRS
Innovative Housing Grants Program



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CELLULOSE INSULATION AS AN AIR BARRIER

October, 1989

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The views and conclusions expressed and the recommendations made in this report are entirely those of the authors and should not be construed as expressing the opinions of Alberta Municipal Affairs.

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FOREWORD

The project documented in this report received funding under the Innovative Housing Grants Program of Alberta Municipal Affairs. The Innovative Housing Grants Program is intended to encourage and assist housing research and development which will reduce housing costs, improve the quality and performance of dwelling units and subdivisions, or increase the long term viability and competitiveness of Alberta's housing industry.

The Program offers assistance to builders, developers, consulting firms, professionals, industry groups, building products manufacturers, municipal governments, educational institutions, non-profit groups and individuals. At this time, priority areas for investigation include building design, construction technology, energy conservation, site and subdivision design, site servicing technology, residential building product development or improvement and information technology.

As the type of project and level of resources vary from applicant to applicant, the resulting documents are also varied. Comments and suggestions on this report are welcome. Please send comments or requests for further information to:

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EXECUTIVE SUMMARY

Can-Cell Industries Inc. has been producing loose-fill and spray applied cellulose insulation for over fifteen years. Recent research work conducted by the firm has concentrated on development of a technique for spray applying moistened insulation into the exterior wall cavities of houses. The results of this work have shown that wet-sprayed wall insulation is both practical to install and trouble free in service. Blower door tests on several houses insulated with this system have shown the system also appears to reduce the degree of air leakage which would otherwise occur when using conventional glass fibre batt wall insulation.

The objective of this study was to determine if the wet sprayed cellulose wall insulation system would function satisfactorily without use of a polyethylene air/vapour barrier. The research was therefore designed to demonstrate that this particular insulation system would form enough of a barrier to air leakage, that moisture accumulation from condensation and vapour diffusion would be insignificant. A secondary objective sought to determine the influence of interior alkyd paint on the vapour diffusion performance of the wall system.

Field work involved construction of a conventional duplex housing unit which was insulated with wet sprayed cellulose in the exterior walls and dry loose-fill cellulose in the attic areas. One half of the unit did not have a polyethylene air/vapor barrier installed. Air leakage and exterior wall moisture levels were monitored for a twelve month period following construction. Data collected during this time indicated that the moisture added to the walls during the insulating process was dissipated over the study period. Comparison of areas with and without polyethylene, the presence of polyethylene sheeting had no significant effect on the moisture levels in either the wall or attic areas of the test

structure. On the other hand testing indicated that the use of polyethylene sheeting in the wall system did serve to improve blower door air test results.

In conclusion, although the air leakage resistance apparently provided by the polyethylene sheeting is significant, the amount is probably not more than could otherwise be obtained by more careful attention to sealing procedures such as those used in the airtight drywall technique. A more important finding is that the use of polyethylene sheeting is not essential in a structure which has the degree of air leakage resistance provided by the insulation system used in this project. Since alkyd paint was applied to the interior walls of both halves of the structure, it was not possible to reach accurate conclusions with respect to the influence of the paint on the vapour diffusion performance of the wall system.

1.0 INTRODUCTION

Previous research has shown that moisture accumulation in exterior walls and in attics is mainly a result of condensation of water vapour which has been transported into the insulated space by convective air leakage, and that little moisture accumulation results from vapour diffusion.

It was therefore reasoned that an insulation system which ensured a void free fit of insulated spaces would reduce air leakage and associated condensation to the extent that a polyethylene barrier would not be necessary. Field monitoring was undertaken to compare air leakage and moisture conditions of two wall and attic components which were identical except for the omission of polyethylene in one case. Specific performance objectives were:

1. to demonstrate that a loose-fill attic/wet-spray wall cellulose insulation in a conventionally framed dwelling unit (along with caulking and/or gasketting at some framing junctions not covered by spray-applied insulation) will exhibit an air leakage level that meets or exceeds the R2000 criteria of 1.5 air changes per hour at 50 Pa pressure differential; and

2. to demonstrate that when this insulation system is used in conjunction with properly painted drywall, the conventional polyethylene sheet, in its role as a vapour diffusion retarder, is redundant.

The results of this study are in agreement with one conducted by the Canada Mortgage and Housing Corporation (CMHC) which examined the issue of whether the moisture load imposed on a wall system during application of the wet-sprayed insulation would dissipate satisfactorily. In that case a section of wall which had no polyethylene sheeting installed also showed moisture levels essentially equal to those in the remainder of the structure.

This report is organized to describe the field test arrangements, the construction details, the monitoring program, the performance results, and the conclusions made.

A record of weather conditions throughout the twelve month monitoring period, as summarized by Environment Canada, is included as Appendix A.

Results of a series of blower door air leakage tests conducted at the beginning and the end of the monitoring period are included as Appendix B.

Wall performance data were generated by electronic moisture and temperature sensors installed and monitored by an engineering firm retained specifically for that purpose. The engineer's report is included as Appendix C.

2.0 APPROACH

2.1 General

A dwelling consisting of two side-by-side units was constructed in St. Albert, Alberta. The units were identical except that polyethylene sheeting was omitted from the exterior wall and ceiling of the east side unit. In both units caulking and/ or gasketting was employed at framing junctions not covered by the spray-applied cellulose. This arrangement permitted comparison of the relative performance of the units with respect to air leakage, moisture content of framing, sheathing and drywall components, and their general thermal efficiency as reflected in energy consumption. Monitoring of electronically generated moisture data was conducted at periodic intervals for one year following installation of the insulation. This data was collated by an engineering firm which produced comprehensive charts and graphs tracking pertinent moisture values throughout the May 1988 to May 1989 study period.

The rationale being examined was that wet sprayed wall insulation would fill the wall cavities so comprehensively that the usual paths of air leakage would be reduced to the point where use of a polyethylene air/vapour barrier would be unnecessary. Approval for deletion of the poly air/vapour barrier from structures using wet sprayed cellulose wall insulation would then be sought, based on the results of the study.

2.2 Selection of Approval Agencies

Consideration was given to seeking approval of the subject wall system from both Alberta Building Standards and the CMHC. Also investigated was the prospect of having the relevant sub-committee of the Associate Committee of the National Building Code (ACNBC) review the system.

The ACNBC subcommitee's response was that consideration at a national level would only be practical following successful field use and, preferably, following adoption by the CMHC or a provincial agency.

Although CMHC expressed interest in receiving the results of this project, this agency is still undecided with respect to accepting the basic wet-sprayed cellulose wall insulation system. It was therefore considered premature to request its evaluation of a variant of that system.

Because Alberta Building Standards has accepted the use of sprayed fibre in external walls for some time, it was decided that approval for the subject system would be sought first from that agency. A formal request for approval will be presented within one month of the date this report is published.

3.0 DESCRIPTION OF MONITORING PROGRAM AND FINDINGS

Alberta Building Standards were requested to review the construction details of the project building and the system for monitoring moisture content, temperature and air leakage. Their response indicated the program would, in their opinion, provide information that would be useful in evaluating a wall system which did not employ a polyethylene vapour retarder. Details of the test dwelling and the monitoring program are described below.

3.1 House Plan

The structure is a conventional two storey duplex with 2" x 6" framed walls, trussed roof and attached garages. The units are completely symmetrical, partitioned on the north/south axis.

The walls were constructed as follows:

- Alkyd paint
- Drywall
- 6 mil polyethylene (west unit only)
- 2" x 6" studding
- 6" sprayed WEATHERSHIELD™ WallBAR Insulation
- 6/16 waferboard sheathing
- Building paper
- vinyl siding

Figure 1 illusrates the orientation of the structure and the wall sections studied.

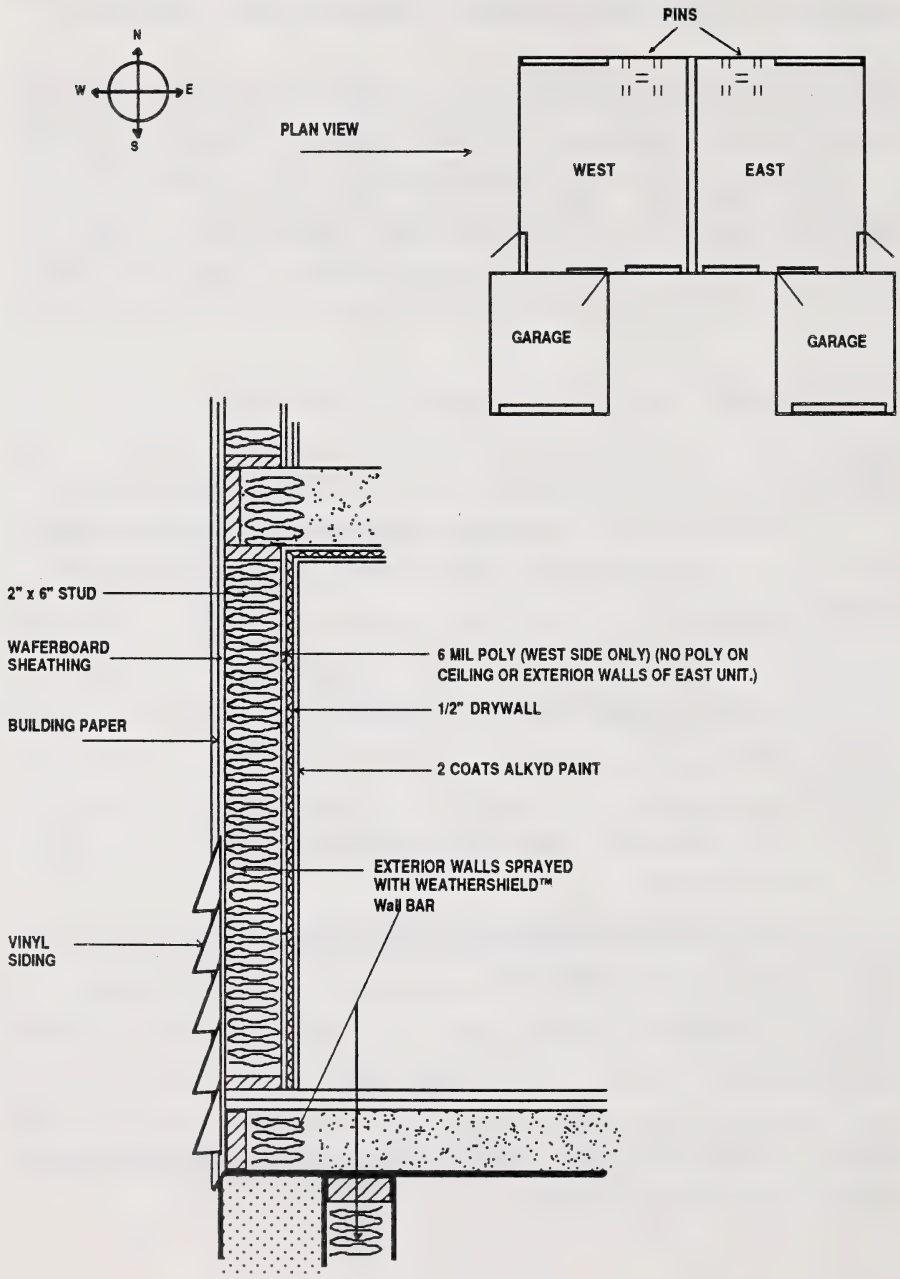

Figure 1: Construction Details

3.2 Electronic Sensor Locations

The north wall of each duplex unit was fitted with moisture pins distributed symmetrically as follows:

1 pair in drywall 3' up from floor.
1 pair in base plate.
4 pairs in studding 18" and 60" from floor
1 pair sheathing
One temperature probe was set in a stud in each wall. Figure 2 depicts sensor locations.

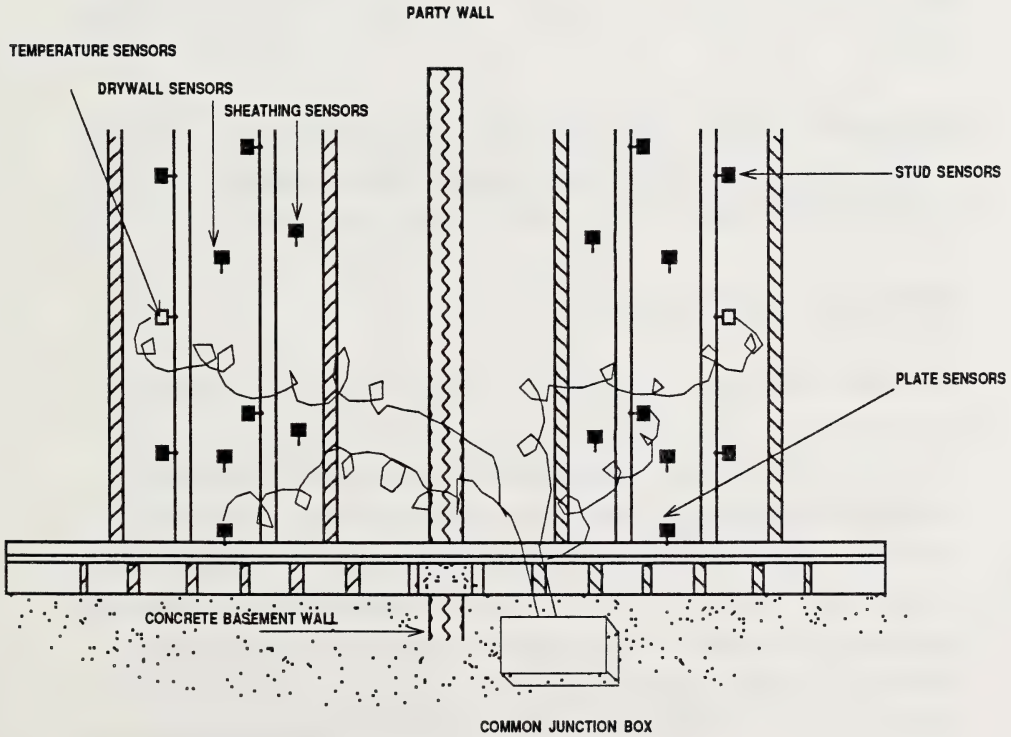

Figure 2: Location of Sensors

3.3 Initial Moisture Measurements

The insulation was determined to have a moisture content of 57% by weight at time of installation. The sheathing, sill plate and studding material had moisture levels of 6%, 12% and 9% respectively.

3.4 Periodic Data Recording

An engineering firm was engaged to install the moisture data acquisition system and obtain subsequent readings at two week intervals for the first two months following installation and periodically thereafter for the ensuing year.

Arrangements were made with Environment Canada to obtain a synopsis of area weather showing daily means of temperature, wind, precipitation and humidity.

3.5 Visual Attic Inspection

The gable end of each unit was fitted with a louvered access door (see Figure 3) which permitted physical inspection of attic conditions. Samples of the loose-fill WEATHERSHIELD™ insulation were removed from each attic for moisture content determination at three month intervals. The moisture content of the material remained constant at about 7% throughout the study period, and showed no appreciable difference between the attic with ceiling poly installed and the one in which the poly was omitted.

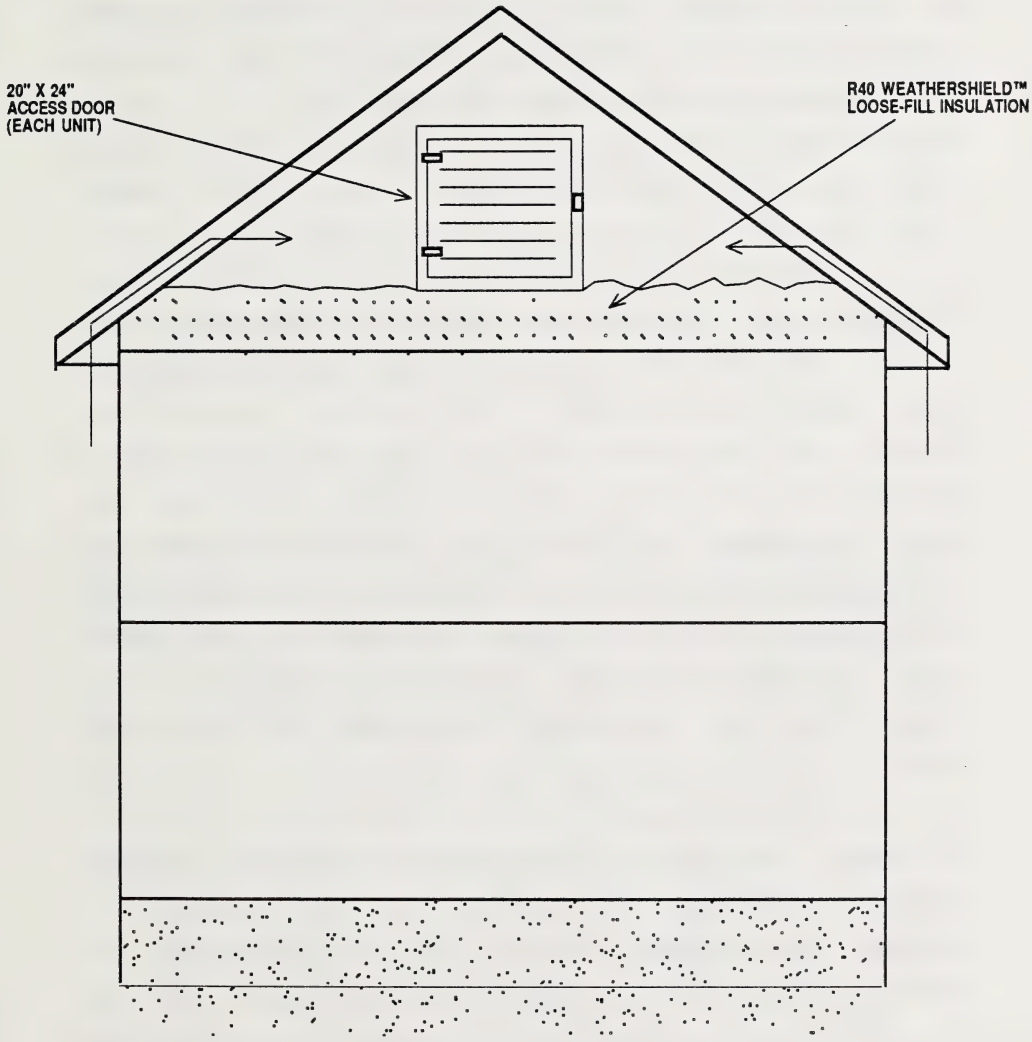

Figure 3: Attic Access

3.6 Air Leakage Testing

An initial attempt at air leakage testing was abandoned because there was sufficient leakage through the party wall partition to invalidate the readings.
On the next occasion, when two machines were used to test both units simultaneously, the west unit tested 1.26 ACH at 50 pa and the east unit tested 2.03 at 50 pa. To confirm the difference was not caused by a disparity in equipment or operating technique of the two air testing firms, the test was repeated with the test equipment switched to the opposite units. This second test confirmed the east unit (no poly) had a leakage rate of about 0.77 ACH higher than the west unit. The reason for the 3/4 ACH difference between the duplex units appeared to be related to the air barrier performance of the polyethylene on the west unit. Smoke tests indicated that the principal leakage routes in both units were the mechanical joints of windows and doors.

Air tests repeated one year later indicated increased overall leakage on both units, with the poly unit still maintaining a leakage rate of about 3/4 ACH lower than the unit which did not have a poly barrier.

3.7 Weather Data

Weather conditions throughout the 12 month period of this study were normal, except for extraordinarily heavy wind-driven rain which occurred July 5 and 6, 1988. As a result, some rain water penetrated the north wall assembly on the west side unit. This penetration was confirmed by a marked rise in the moisture level recorded by the sensor pins in the test section of that unit. Subsequent precipitation was below normal throughout the fall and winter months.

3.8 Electronic Sensor Data

Data from the sixteen moisture sensors embedded in the wall assemblies indicated moisture from the insulation migrated into the framing lumber, drywall and sheathing, so as to cause peak moisture content readings of about 30% about 30 days after the installation of the insulation. Recorded data further indicates a gradual, continuous drying trend continued from about Day 30 to about Day 250, when all components except the sheathing had dried to the moisture content which had existed prior to the installation of the insulation.Because the test walls were drywalled less than 24 hours after the insulation was installed, it is apparent that moisture from the insulation dissipated outward through the wall assembly.

A significant exception to the above trend occurred as a result of a heavy wind driven rain which penetrated the test wall section of the poly unit sufficiently to cause a major spike in recorded moisture levels about Day 60.

3.9 Visual Inspection of Wall Cavities

At the end of the one year test period, sections of the vinyl siding and waferboard sheathing were removed from both units to expose the wall cavity, insulation and interior drywall. Direct reading of the moisture content of the framing lumber, drywall and sheathing taken at that time confirmed the accuracy of the data recorded from the embedded sensors. The insulation material was dry, firm and tightly adhered to the sheathing, studding and upper plate.

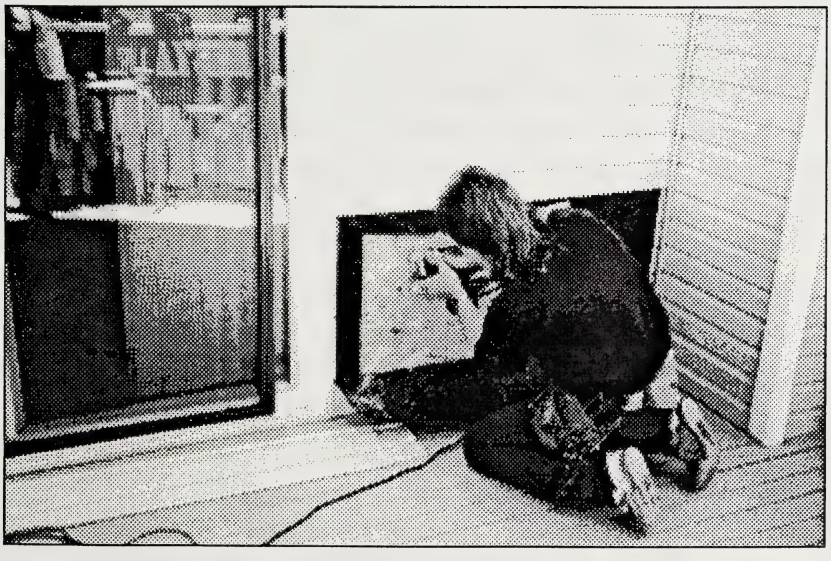

Figure 4: Wall Cavity Inspection

4.0 CONCLUSIONS AND RECOMMENDATIONS

The objective of this project was to determine if a wall cavity insulated with spray-applied cellulose insulation would by itself provide resistance to the usual paths of air leakage to the extent that it would serve satisfactorily without the use of a conventional polyethylene air/vapour barrier as described by the Alberta Building Code. The following conclusions were drawn with respect to the work done relative to the objective:

1. Blower door air leakage testing indicated that the unit with a polyethylene air/vapour barrier installed exhibited a leakage rate of 1.26 ACH when the study commenced, and 1.88 ACH one year later. Comparable values for the unit without a polyethylene air/vapour barrier were 2.03 ACH and 2.63 ACH, respectively. Although neither unit met the target R2000 criteria of 1.5 ACH, it is considered significant that both units performed better than the average conventionally built house, which according to recent studies, displays an air leakage rate of approximately 3.0 ACH.

2. For both wall systems, moisture loading through vapour diffusion or through condensation did not occur. Since both interior surfaces were coated with alkyd paint, it is difficult to comparatively gauge the role of the paint in this regard. Of greater significance is the absence of the polyethylene sheeting in the east wall section and the equal performance of that wall to the west wall, which incorporated a full polyethylene sheet vapour diffusion retarder. This indicates that performance with respect to vapour diffusion and condensation within the wall cavity was not enhanced by the addition of polyethylene sheeting.

3. Although the wet spray insulation system involved loading both wall cavities with a significant amount of moisture at the outset, this excess moisture dissipated from the structure over a reasonable period of time. The addition of bulk moisture to the west (poly) wall as a result of the July 5 and 6, 1988 rainstorm had no deleterious effect on the wall system or the structure. In fact, the west wall dried to roughly the same moisture levels as the east wall in spite of the added bulk moisture. This study served to demonstrate the good drying capabilities of the wet-sprayed cellulose system, both with and without a polyethylene air/vapour barrier.

Overall, it was concluded that with the wet-sprayed cellulose insulation system, polyethylene sheeting is not required in the traditional sense of preventing moisture accumulation in the wall assembly, nor is it necessary to provide a reasonably airtight wall system.

Based on these results and conclusions, Alberta Building Standards will be requested to review the issue of the polyethylene air/vapour barrier from the perspective of making its use optional with the sprayed cellulose wall system. It will be further requested that the use of a ceiling polyethylene air/vapour barrier also be deemed optional when loose-fill cellulose insulation is installed in the attic.

APPENDIX A:
Weather Summary

Environment Canada / Environnement Canada

Atmospheric Environment Service / Service de l'environnement atmosphérique

AUG 18 1989.

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS JUNE/JUIN 1988

AT/A EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 °34 N LONG 113 °31 W ELEVATION/ALTITUDE 671 FEET (ASL) / PIEDS (MER) STANDARD TIME USED / HEURE NORMALE UTILISÉE MOUNTAIN / DES ROCHEUSES

DATE	TEMPERATURE / TEMPÉRATURE MAXIMUM / MAXIMALE °C	MINIMUM / MINIMALE °C	MEAN / MOYENNE °C	DEGREE-DAYS / DEGRÉS-JOURS HEATING / DE CHAUFFE BASE 18°C	GROWING / DE CROISSANCE BASE 5°C	COOLING / DE RÉFRIGÉRATION BASE 18°C	REL HUMIDITY / HUMIDITÉ REL MAXIMUM / MAXIMALE %	MINIMUM / MINIMALE %	THUNDERSTORM / ORAGE	PRECIPITATION / PRÉCIPITATIONS RAINFALL / PLUIE (HAUTEUR) mm	SNOWFALL / NEIGE (HAUTEUR) cm	TOTAL PRECIP / PRÉCIP TOTALE mm	SNOW ON GROUND / NEIGE AU SOL cm	WIND / VENT AVERAGE SPEED / VITESSE MOYENNE km/h	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE MOYENNE MAX. SUR 2 MIN & DIRECTION km/h	BRIGHT SUNSHINE / INSOLATION EFFECTIVE HOURS / HEURES
1	19.5	6.7	13.1	4.9	9.1		81	43	1	0.6		0.6		9.3	NNW*	ESE 37	11.0
2	19.8	8.3	14.1	3.9	9.1		82	22		TR		TR		14.7	W	W 28*	13.8
3	25.8	9.5	17.7	0.3	12.7		51	23		TR		TR		10.8	ESE	S 20	12.9
4	23.5	11.9	17.7	0.3	12.7		62	38						10.8	WNW	WNW 20	8.6
5	20.1	13.7	16.9	1.1	11.9		94	68	1	9.2		9.2		16.7	NNW	NNW 24	3.7
6	20.5	13.5	17.0	1.0	12.0		88	68						14.8	NNW	NNE 22*	3.9
7	16.2	10.6	13.4	4.6	8.4		100	77		0.2		0.2		10.8	NNE*	E 20	0.0
8	19.2	12.4	15.8	2.2	10.8		100	60		37.0		37.0		8.0	S	N 22	1.9
9	22.3	9.7	16.0	2.0	11.0		94	33		13.8		13.8		21.8	SSE	W 37	11.9
10	25.5	11.7	18.6		13.6	0.6	94	38	1	15.0		15.0		13.2	S	NW 24	8.0
11	12.7	8.4	10.6	7.4	5.6		100	71		15.4		15.4		20.1	W	WNW 30	0.8
12	16.9	6.0	11.5	6.5	6.5		93	51		TR		TR		9.5	WNW	W 19*	8.7
13	20.4	9.8	15.1	2.9	10.1		87	35		TR		TR		11.8	W	N 19*	12.1
14	20.4	6.1	13.3	4.7	8.3		87	35						8.0	NW	N 15	16.1
15	25.3	10.5	18.4		13.4	0.4	88	28	1	1.0		1.0		18.5	SSE	SSE 30*	12.6
16	25.9	11.9	19.4		14.4	1.4	88	34		TR		TR		7.0	WNW	ENE 17*	13.9
17	25.9	14.2	20.1		15.1	2.1	77	36						7.3	ENE*	N 17	12.7
18	23.8	14.1	19.0		14.0	1.0	82	50	1	11.8		11.8		10.9	NW*	N 30	8.6
19	21.8	10.3	16.1	1.9	11.1		76	36		0.4		0.4		7.8	SW	N 19	13.0
20	19.9	11.3	15.6	2.4	10.6		88	40		1.8		1.8		11.1	N	N 30	7.1
21	22.8	9.9	16.4	1.6	11.4		94	38		0.2		0.2		4.9	SW*	SSE 11*	9.0
22	25.7	14.8	20.3		15.3	2.3	94	44	1	7.0		7.0		10.3	E*	SE 20	5.0
23	23.8	12.0	17.9	0.1	12.9		94	46	1	7.4		7.4		8.7	NW	NNW 22	11.6
24	20.5	10.6	15.6	2.4	10.6		94	40		11.2		11.2		14.1	WNW	NNW 25	14.2
25	28.7	9.6	19.2		14.2	1.2	82	32						16.5	SSE	SSE 30	14.7
26	23.0	16.1	19.6		14.6	1.6	94	36		3.4		3.4		10.5	SSE*	SSE 24	6.6
27	25.1	15.0	20.1		15.1	2.1	94	57	1	1.2		1.2		7.9	N*	E 15*	11.3
28	21.8	15.9	18.9		13.9	0.9	100	69	1	17.6		17.6		10.8	NNW	NNW 20	6.2
29	18.9	13.2	16.1	1.9	11.1		94	68		0.2		0.2		13.8	W	W 24	1.8
30	23.1	10.6	16.9	1.1	11.9		94	31		3.0		3.0		17.5	W	WSW 24	8.8
31																	
MEAN / MOYENNE	22.0	11.3	16.7	TOTAL 53.2	TOTAL 350.4	TOTAL 13.6	88	45	TOT 9	TOTAL 157.4	TOTAL 0.0	TOTAL 157.4		11.9	PREVAILING / DOMINANT W	MAXIMUM ESE 37*	TOTAL 270.4
NORMAL / NORMALE	20.7	9.5	15.1	98.7	303.6	12.2			5	77.3	TR	77.3		15.4	WNW		271.7

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRES JOURS

BELOW 5°C / AU-DESSOUS DE 5°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE	ABOVE 5°C / AU-DESSUS DE 5°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	53.2	47.6	98.7	TOTAL FOR MONTH / TOTAL DU MOIS	350.4	358.4	303.6
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	4491.4	4713.5	5483.7	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	702.6	693.0	556.0

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRÉCIPITATIONS TOTALES (mm): 0.2 OR MORE / OU PLUS; 1.0 OR MORE / OU PLUS; 2.0 OR MORE / OU PLUS; 5.0 OR MORE / OU PLUS; 10.0 OR MORE / OU PLUS

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE (cm): 0.2 OR MORE / OU PLUS; 1.0 OR MORE / OU PLUS; 2.0 OR MORE / OU PLUS; 5.0 OR MORE / OU PLUS; 10.0 OR MORE / OU PLUS

0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.0 OR MORE / OU PLUS	5.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.0 OR MORE / OU PLUS	5.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS
20	15	12	7	0	0	0	0	0	0

Environment Canada / Environnement Canada
Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS JULY/JUILLET 1988

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 34 N LONG 113 31 W ELEVATION/ALTITUDE 671 METRES (ASL) / METRES (NMM)
STANDARD TIME USED: MOUNTAIN / HEURE NORMALE UTILISÉE DES ROCHEUSES

DATE	TEMPERATURE / TEMPERATURE			DEGREE-DAYS / DEGRÉS-JOURS			REL. HUMIDITY / HUMIDITÉ REL.		THUNDERSTORM / ORAGE	PRECIPITATION / PRECIPITATIONS			SNOW ON GROUND / NEIGE AU SOL	WIND / VENT			BRIGHT SUNSHINE / INSOLATION EFFECTIVE
	MAXIMUM / MAXIMALE	MINIMUM / MINIMALE	MEAN / MOYENNE	HEATING / DE CHAUFFE	GROWING / DE CROISSANCE	COOLING / DE RÉFRIGÉRATION	MAXIMUM / MAXIMALE	MINIMUM / MINIMALE		RAINFALL / PLUIE (HAUTEUR)	SNOWFALL / NEIGE (HAUTEUR)	TOTAL PRECIP. / PRÉCIP. TOTALE		AVERAGE SPEED / VITESSE MOYENNE	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION	
	°C	°C	°C	BASE 18.0°C	BASE 5.0°C	BASE 18.0°C	%	%		mm	cm	mm	cm	km/h		km/h	HOURS / HEURES
1	21.9	9.6	15.8	2.2	10.8		76	38						8.0	S	S 19	15.0
2	20.5	13.3	16.9	1.1	11.9		88	59		0.2		0.2		8.3	E	ENE 17	1.8
3	19.8	10.3	15.1	2.9	10.1		94	46	1	16.2		16.2		14.9	WNW	WNW 24	12.1
4	20.3	9.9	15.1	2.9	10.1		87	43						6.2	WNW	WNW 11*	11.8
5	16.3	10.6	13.5	4.5	8.5		100	82		37.4		37.4		10.5	NNW	NNW 33	0.0
6	13.0	10.2	11.6	6.4	6.6		100	72		59.0		59.0		33.5	W	WNW 44	0.0
7	20.5	11.7	16.1	1.9	11.1		82	53		TR		TR		22.9	W	W 39	12.6
8	23.5	12.2	17.9	0.1	12.9		76	41						17.8	W	WNW 25*	15.2
9	21.4	9.4	15.4	2.6	10.4		94	60						10.3	E	E 22	12.6
10	21.7	11.9	16.8	1.2	11.8		94	60		2.4		2.4		15.8	ESE	ESE 22*	9.0
11	26.0	14.1	20.1		15.1	2.1	83	45	1	5.2		5.2		20.6	ESE	ESE 28*	10.8
12	19.5	12.0	15.8	2.2	10.8		94	67		1.4		1.4		21.5	WNW	WNW 41	1.7
13	21.5	8.7	15.1	2.9	10.1		87	46	1	2.4		2.4		6.9	W	E 22	14.0
14	16.9	10.4	13.7	4.3	8.7		94	67	1	12.2		12.2		11.0	W	W 32	4.5
15	20.1	9.4	14.8	3.2	9.8		77	37						12.0	W	SSW 19	11.7
16	21.3	11.0	16.2	1.8	11.2		71	37						17.5	W	WNW 33	14.3
17	21.1	9.8	15.5	2.5	10.5		87	40						9.0	NW	NW 19*	12.7
18	21.7	12.3	17.0	1.0	12.0		94	53	1	1.2		1.2		15.0	WNW	W 20	11.9
19	24.4	12.1	18.3		13.3	0.3	88	47						4.8	WNW	NW 13*	13.2
20	28.1	14.2	21.2		16.2	3.2	82	40						10.8	S	SSW 20	14.0
21	30.8	15.3	23.1		18.1	5.1	73	29						16.3	WNW	N 37	14.6
22	22.2	13.2	17.7	0.3	12.7		88	36						13.5	W	WSW 22*	5.2
23	22.5	10.8	16.7	1.3	11.7		58	27						4.9	S	W 17	14.0
24	25.6	14.3	20.0		15.0	2.0	67	36						4.9	S	W 17	10.2
25	26.3	16.7	21.5		16.5	3.5	77	42		0.2		0.2		7.9	WSW*	WSW 22	9.5
26	31.0	14.8	22.9		17.9	4.9	82	29						10.5	SSW	SSW 22	12.8
27	21.3	14.0	17.7	0.3	12.7		88	43		1.2		1.2		7.8	NW	NW 15*	8.5
28	22.4	12.1	17.3	0.7	12.3		82	43						10.3	WSW	WNW 19	9.6
29	25.2	11.6	18.4		13.4	0.4	88	41		TR		TR		6.8	S	SE 15	10.9
30	21.7	13.2	17.5	0.5	12.5		94	35		0.9		0.9		16.3	WNW	NW 24*	10.6
31	21.6	11.9	16.8	1.2	11.8		63	33						10.0	W	WNW 20	7.8
MEAN / MOYENNE	22.3	12.0	17.2	TOTAL 48.0	TOTAL 376.5	TOTAL 21.5	83	46	TOT 5	TOTAL 139.9	TOTAL 0.0	TOTAL 139.9		12.5	PREVAILING DOMINANT	MAXIMALE WNW 44	TOTAL 312.6
NORMAL / NORMALE	23.0	11.8	17.4	48.7	385.7	31.5			8	88.7	0.0	88.7		14.0	WNW		306.4

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C / AU-DESSOUS DE 18°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE	ABOVE 5°C / AU-DESSUS DE 5°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	48.0	58.8	48.7	TOTAL FOR MONTH / TOTAL DU MOIS	376.5	374.0	385.7
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	48.0	58.8	48.7	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	1079.1	1067.0	941.7

DAYS WITH TOTAL PRECIPITATION: JOURS AVEC PRÉCIPITATIONS TOTALES:

mm: 0.2 OR MORE / 0.2 OU PLUS	1.0 OR MORE / 1.0 OU PLUS	2.0 OR MORE / 2.0 OU PLUS	5.0 OR MORE / 5.0 OU PLUS	10.0 OR MORE / 10.0 OU PLUS	cm: 0.2 OR MORE / 0.2 OU PLUS	1.0 OR MORE / 1.0 OU PLUS	2.0 OR MORE / 2.0 OU PLUS	5.0 OR MORE / 5.0 OU PLUS	10.0 OR MORE / 10.0 OU PLUS
13	10	7	4	1	0	0	0	0	0

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE

0.2 OR MORE / 0.2 OU PLUS	1.0 OR MORE / 1.0 OU PLUS	2.0 OR MORE / 2.0 OU PLUS	5.0 OR MORE / 5.0 OU PLUS	10.0 OR MORE / 10.0 OU PLUS

Environment Canada / Environnement Canada
Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS AUGUST/AOUT 1988

AT/A EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 °34 N LONG 113 °31 W ELEVATION/ALTITUDE 671 METRES ASL / MÈTRES AMM STANDARD TIME USED/HEURE NORMALE UTILISÉE MOUNTAIN / DES ROCHEUSES

DATE	TEMPERATURE / TEMPÉRATURE			DEGREE-DAYS / DEGRÉS-JOURS			REL HUMIDITY / HUMIDITÉ REL		THUNDERSTORM / ORAGE	PRECIPITATION / PRÉCIPITATIONS			SNOW ON GROUND / NEIGE AU SOL	WIND / VENT			BRIGHT SUNSHINE / DURÉE D'INSOLATION EFFECTIVE
	MAXIMUM / MAXIMALE °C	MINIMUM / MINIMALE °C	MEAN / MOYENNE °C	HEATING / DE CHAUFFE BASE 18°C	GROWING / DE CROISSANCE BASE 5°C	COOLING / DE RÉFRIGÉRATION BASE 18°C	MAXIMUM / MAXIMALE %	MINIMUM / MINIMALE %		RAINFALL / PLUIE (MM)	SNOWFALL / NEIGE (CM)	TOTAL PRECIP / PRÉCIP TOTALE (MM)	(CM)	AVERAGE SPEED / VITESSE MOYENNE KM/H	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION KM/H	HOURS / HEURES
1	18.1	10.5	14.3	3.7	9.3		87	63						13.0	N	N 24	3.1
2	22.4	10.3	16.4	1.6	11.4		87	38						8.5	NW	NW 15	12.0
3	25.6	11.8	18.7		13.7	0.7	77	44						9.8	SSW	NW 19	8.7
4	26.2	13.8	20.0		15.0	2.0	82	44		TR		TR		9.3	N	NNW 22	9.0
5	17.8	11.9	14.9	3.1	9.9		82	52		0.8		0.8		11.1	W	W 20	2.7
6	13.2	8.7	11.0	7.0	6.0		100	87	1	24.2		24.2		11.8	N	N 22	0.0
7	19.5	8.6	14.1	3.9	9.1		100	43		TR		TR		7.7	W	W 11	12.0
8	23.7	9.2	16.5	1.5	11.5		93	38						8.7	S	W 15	7.9
9	20.9	12.8	16.9	1.1	11.9		88	53	1	2.8		2.8		10.4	W	NW 19	5.9
10	21.5	10.7	16.1	1.9	11.1		77	43						12.5	W	NW 20	13.9
11	21.5	10.5	16.0	2.0	11.0		88	49						7.2	W	WSW 13	11.8
12	24.8	10.5	17.7	0.3	12.7		88	44						10.0	S	S 19	14.1
13	26.9	12.0	19.5		14.5	1.5	82	39						4.6	NW	NW 13	14.0
14	21.8	11.4	16.6	1.4	11.6		94	41		4.8		4.8		10.3	NW	NW 22	8.8
15	19.6	9.5	14.6	3.4	9.6		100	52						5.8	NE	NE 15	7.1
16	18.7	12.6	15.7	2.3	10.7		94	64		0.6		0.6		11.9	ENE	E 24	0.2
17	18.8	12.4	15.6	2.4	10.6		88	72		TR		TR		19.2	SE	ESE 26	1.6
18	19.9	13.4	16.7	1.3	11.7		100	56	1	22.6		22.6		11.8	W	E 19	5.3
19	21.9	8.8	15.4	2.6	10.4		93	46						5.3	W	NW 22	10.8
20	14.8	11.0	12.9	5.1	.9		100	77		27.8		27.8		12.3	NW	NNW 19	0.0
21	20.5	11.0	15.8	2.2	10.8		100	49	1	12.0		12.0		22.8	WNW	NW 37	5.8
22	21.4	10.4	15.9	2.1	10.9		82	43		TR		TR		17.8	WNW	WNW 26	13.1
23	25.4	11.2	18.3		13.3	0.3	82	39						8.8	W	W 15	13.3
24	22.4	13.7	18.1		13.1	0.1	68	33						4.9	NW	NW 11	10.3
25	24.4	8.8	16.6	1.4	11.6		88	41						4.2	E	N 11	12.1
26	16.8	9.5	13.2	4.8	8.2		87	55						10.2	N	N 20	11.7
27	20.9	7.4	14.2	3.8	9.2		87	46						8.9	S	SE 15	13.0
28	25.7	9.2	17.5	0.5	12.5		81	41						14.0	SSE	SSE 22	11.5
29	28.3	12.1	20.2		15.2	2.2	82	37	1	0.6		0.6		18.4	SSE	NW 56	11.9
30	18.5	10.5	14.5	3.5	9.5		82	37		1.2		1.2		18.6	W	W 33	7.4
31	20.6	12.4	16.5	1.5	11.5		55	35						19.0	W	WNW 37	10.9
MEAN / MOYENNE	21.4	10.9	16.2	TOTAL 64.4	TOTAL 345.4	TOTAL 6.8	87	48	TOT 5	TOTAL 97.4	TOTAL 0.0	TOTAL 97.4		11.2	PREVAIL DIR W DOMINANTE	MAXIMALE NW 56	TOTAL 259.9
NORMAL / NORMALE	21.6	10.7	16.2	78.0	346.1	21.1			6	77.9	0.0	77.9		13.4	S		276.8

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C / AU-DESSOUS DE 18°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE	ABOVE 5°C / AU-DESSUS DE 5°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	64.4	135.3	78.0	TOTAL FOR MONTH / TOTAL DU MOIS	345.4	269.8	346.1
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	112.4	194.1	126.7	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	1424.5	1336.8	1287.8

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRÉCIPITATIONS TOTALES (mm)

0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	20.0 OR MORE / OU PLUS
10	7	6	4	0

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE (cm)

0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.5 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	25.0 OR MORE / OU PLUS	50.0 OR MORE / OU PLUS
0	0	0	0	0	0

Environment Canada / Atmospheric Environment Service — Environnement Canada / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS SEPTEMBER/SEPTEMBRE 1988

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 °34 N LONG 113 °31 W ELEVATION/ALTITUDE 671 METRES (ASL) / METRES (NMM) STANDARD TIME USED/HEURE NORMALE UTILISEE MOUNTAIN / DES ROCHEUSES

DATE	TEMPERATURE / TEMPERATURE			DEGREE-DAYS / DEGRES-JOURS			REL HUMIDITY / HUMIDITE REL		THUNDERSTORM / ORAGE	PRECIPITATION / PRECIPITATIONS			SNOW ON GROUND / NEIGE AU SOL	WIND / VENT			BRIGHT SUNSHINE / INSOLATION EFFECTIVE
	MAXIMUM / MAXIMALE °C	MINIMUM / MINIMALE °C	MEAN / MOYENNE °C	HEATING / DE CHAUFFE BASE 18°C	GROWING / DE CROISSANCE BASE 5°C	COOLING / DE REFRIGERATION BASE 18°C	MAXIMUM / MAXIMALE %	MINIMUM / MINIMALE %		RAINFALL / PLUIE (HAUTEUR) mm	SNOWFALL / NEIGE (HAUTEUR) cm	TOTAL PRECIP / PRECIP TOTALE mm	cm	AVERAGE SPEED / VITESSE MOYENNE km/h	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION km/h	HOURS / HEURES
1	25.5	10.9	18.2		13.2	0.2	68	36						9.9	W	W 24	12.1
2	29.3	11.8	20.6		15.6	2.6	88	29						2.8	SW	W 11	12.9
3	29.1	11.7	20.4		15.4	2.4	82	40						11.9	E	E 26*	12.2
4	28.6	15.5	22.1		17.1	4.1	68	38						10.3	SE*	SE 22	12.2
5	30.3	15.4	22.9		17.9	4.9	56	25						22.0	S	SSE 52	11.2
6	22.0	10.7	16.4	1.6	11.4		94	35		2.0		2.0		13.9	NW	WNW 32	3.1
7	14.9	7.1	11.0	7.0	6.0		87	36		0.6		0.6		28.9	WNW	WNW 41*	9.0
8	16.1	4.9	10.5	7.5	5.5		81	33		TR		TR		18.9	WNW	WNW 37	11.0
9	13.2	4.5	8.9	9.1	3.9		93	54		4.0		4.0		4.0	NW	SE 13	2.4
10	11.6	5.1	8.4	9.6	3.4		100	62		9.0		9.0		4.7	W	E 11*	1.8
11	16.8	2.2	9.5	8.5	4.5		100	36						10.3	SSW	SSW 20	10.9
12	22.2	9.5	15.9	2.1	10.9		76	38						12.7	NW*	NW 30	11.5
13	24.5	7.4	16.0	2.0	11.0		93	38						8.5	SSW	SSW 20	11.3
14	25.4	10.4	17.9	0.1	12.9		87	38						5.1	ESE	SE 11	8.1
15	19.3	11.2	15.3	2.7	10.3		94	56						13.5	NW	NW 24*	5.7
16	12.6	4.7	8.7	9.3	3.7		100	82		22.4		22.4		18.6	NW	NW 24*	0.0
17	7.3	3.1	5.2	12.8	0.2		87	61						9.0	NW	NW 15*	0.7
18	11.3	2.7	7.0	11.0	2.0		87	47						11.1	S	S 20*	10.4
19	9.7	4.4	7.1	10.9	2.1		93	62		3.8		3.8		16.2	ESE	E 24	0.0
20	7.7	0.3	4.0	14.0			93	70						10.9	S	S 20	4.2
21	13.8	1.1	7.5	10.5	2.5		93	44						17.0	W	WNW 41	8.2
22	13.9	4.3	9.1	8.9	4.1		70	35						13.6	W	WNW 24*	8.8
23	11.6	2.1	6.9	11.1	1.9		81	43		TR		TR		8.9	W	W 19*	5.2
24	10.0	1.7	5.9	12.1	0.9		100	46		0.8		0.8		4.8	SSW	WNW 20	6.6
25	6.1	-1.7	2.2	15.8			100	93		4.4		4.4		9.6	E	E 17*	0.0
26	8.7	0.4	4.6	13.4			100	66		0.2		0.2		10.6	SE	SE 22*	3.4
27	7.2	2.1	4.7	13.3			93	81		0.4		0.4		11.2	SE	SE 26	0.0
28	15.0	1.1	8.1	9.9	3.1		93	48						11.1	S	S 19*	5.2
29	24.5	10.6	17.6	0.4	12.6		72	36		TR		TR		12.8	SSW	N 26	7.2
30	16.3	6.1	11.2	6.8	6.2		82	34		TR		TR		15.5	WNW*	NW 43	10.2
31																	
MEAN / MOYENNE	16.8	6.0	11.4	TOTAL 210.4	TOTAL 198.3	TOTAL 14.2	87	48	TOT 0	TOTAL 47.6	TOTAL 0.0	TOTAL 47.6		11.9	PREVAILING S	MAXIMUM SSE 52	TOTAL 205.5
NORMAL / NORMALE	16.5	5.6	11.0	210.4	189.2	1.7			1	37.0	2.2	39.1		14.6	S		182.2

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRES JOURS

BELOW 18°C / AU-DESSOUS DE 18°C	THIS YEAR / ANNEE EN COURS	PREVIOUS YEAR / ANNEE PRECEDENTE	NORMAL / NORMALE	ABOVE 5°C / AU-DESSUS DE 5°C	THIS YEAR / ANNEE EN COURS	PREVIOUS YEAR / ANNEE PRECEDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	210.4	124.0	210.4	TOTAL FOR MONTH / TOTAL DU MOIS	198.3	266.3	189.2
ACCUMULATED SINCE JULY 1 / ACCUMULEE DEPUIS LE 1er JUILLET	322.8	318.1	337.1	ACCUMULATED SINCE APRIL 1 / ACCUMULEE DEPUIS LE 1er AVRIL	1622.8	1603.1	1477.0

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRECIPITATIONS TOTALES

0.2 mm OR MORE / OU PLUS	1.0 mm OR MORE / OU PLUS	10 mm OR MORE / OU PLUS	100 mm OR MORE / OU PLUS
10	6	6	1

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE

0.2 cm OR MORE / OU PLUS	1.0 cm OR MORE / OU PLUS	10 cm OR MORE / OU PLUS	50 cm OR MORE / OU PLUS
0	0	0	0

Environment Canada / Environnement Canada
Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS OCTOBER/OCTOBRE 1988

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 °34 ' N LONG: 113 °31 ' W ELEVATION/ALTITUDE 671 METRES (ASL) / METRES (NMM) STANDARD TIME USED/HEURE NORMALE UTILISEE: MOUNTAIN / DES ROCHEUSES

DATE	TEMPERATURE / TEMPÉRATURE			DEGREE-DAYS / DEGRÉS-JOURS			REL. HUMIDITY / HUMIDITÉ REL.		THUNDERSTORM / ORAGE	PRECIPITATION / PRÉCIPITATIONS			SNOW ON GROUND / NEIGE AU SOL	WIND / VENT			BRIGHT SUNSHINE / INSOLATION EFFECTIVE
	MAXIMUM / MAXIMALE °C	MINIMUM / MINIMALE °C	MEAN / MOYENNE °C	HEATING / DE CHAUFFE BASE 18.0°C	GROWING / DE CROISSANCE BASE 5.0°C	COOLING / DE RÉFRIGÉRATION BASE 18.0°C	MAXIMUM / MAXIMALE %	MINIMUM / MINIMALE %		RAINFALL / PLUIE (HAUTEUR) mm	SNOWFALL / NEIGE (HAUTEUR) cm	TOTAL PRECIP / PRÉCIP. TOTALE mm	cm	AVERAGE SPEED / VITESSE MOYENNE km/h	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION km/h	HOURS / HEURES
1	13.0	4.2	8.6	9.4	3.6		81	47						3.6	WSW	W 7*	0.0
2	13.3	0.1	6.7	11.3	1.7		93	44						9.3	ENE	NNE 19*	9.7
3	14.1	1.9	8.0	10.0	3.0		75	44						21.6	SE	SSE 28	8.8
4	17.9	3.3	10.6	7.4	5.6		70	45						18.6	SSE	SSE 24*	9.6
5	21.0	3.9	12.5	5.5	7.5		81	49						4.8	S	S 19	9.6
6	21.7	2.1	11.9	6.1	6.9		93	35						7.3	SE	SE 20	9.8
7	20.1	7.3	13.7	4.3	8.7		76	43		TR		TR		9.3	W	WNW 19	8.8
8	20.2	7.4	13.8	4.2	8.8		76	32		TR		TR		11.5	W*	WSW 20	8.0
9	19.3	9.9	14.6	3.4	9.6		66	39						7.0	WNW	W 13*	9.7
10	22.4	5.8	14.1	3.9	9.1		81	38						3.0	SSW	ESE 9	9.6
11	19.0	6.1	12.6	5.4	7.6		87	49						4.3	S	SSE 9	9.5
12	24.6	4.9	14.8	3.2	9.8		93	27						3.7	S	S 9	9.3
13	21.6	5.0	13.3	4.7	8.3		70	33						4.5	S	W 15	6.7
14	16.2	6.8	11.5	6.5	6.5		93	45		0.4		0.4		9.7	NW*	NW 22	2.5
15	12.1	2.5	7.3	10.7	2.3		81	35		TR		TR		13.3	W	WNW 26*	9.9
16	10.8	3.6	7.2	10.8	2.2		87	50		0.2		0.2		12.0	W*	W 20	3.6
17	9.5	0.9	5.2	12.8	0.2		81	36						13.4	WNW	WNW 26	9.0
18	9.3	-0.7	4.3	13.7			64	34						8.4	W*	W 13*	8.3
19	16.1	-0.8	7.7	10.3	2.7		80	39		1.0		1.0		10.4	W	WNW 24	3.3
20	11.2	3.6	7.4	10.6	2.4		81	47						12.9	W*	NNW 26	5.9
21	18.8	2.5	10.7	7.3	5.7		75	42		TR		TR		13.5	S	WNW 41	1.1
22	8.4	-3.3	2.6	15.4			74	44						16.6	WNW	WNW 32	8.3
23	12.2	1.5	6.9	11.1	1.9		75	43		TR		TR		9.5	WNW	W 20*	3.0
24	10.3	0.8	5.6	12.4	0.6		75	37		TR		TR		12.8	W*	WNW 26	9.1
25	6.1	-7.0	-0.5	18.5			100	56		TR	TR	TR		12.0	ESE	SW 30	0.1
26	2.4	-7.2	-2.4	20.4			93	50		TR	0.8	0.8		25.0	NW	WNW 39*	4.0
27	-4.4	-11.1	-7.8	25.8			86	58			TR	TR	TR	8.0	NW	NW 24	4.8
28	-0.7	-10.7	-5.7	23.7			92	54		TR	TR	TR	TR	6.9	S	SE 19	8.4
29	4.1	-8.4	-2.2	20.2			85	48					TR	10.7	S	S 20	7.8
30	14.9	-3.9	5.5	12.5	0.5		80	30						17.5	W	S 24	6.5
31	9.8	-2.8	3.5	14.5			69	37						7.5	SSW	SSE 15*	1.8
MEAN / MOYENNE	13.4	0.9	7.2	TOTAL 336.0	TOTAL 115.2	TOTAL 0.0	81	42	TOT 0	TOTAL 1.6	TOTAL 0.8	TOTAL 2.4		10.7	PREVAILING DOMINANT	MAXIMUM WNW 41	TOTAL 206.5
NORMAL / NORMALE	11.1	0.4	5.8	379.9	75.9	0.1			0	9.1	7.5	16.6		14.3	S		161.8

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C / AU-DESSOUS DE 18°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE	ABOVE 5°C / AU-DESSUS DE 5°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	336.0	343.3	379.9	TOTAL FOR MONTH / TOTAL DU MOIS	115.2	88.1	75.9
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	658.8	661.4	717.0	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	1738.0	1691.2	1552.9

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRÉCIPITATIONS TOTALES

mm: 0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	5.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	50.0 OR MORE / OU PLUS	cm: 0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	5.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	50.0 OR MORE / OU PLUS
4	1	0	0	0	1	0	0	0	0

Canada

Atmospheric Environment Service

Service de l'environnement atmosphérique

SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS NOVEMBER/NOVEMBRE 1988

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 °34 N LONG: 113 °31 W ELEVATION/ALTITUDE: 671 METRES (ASL) / MÈTRES (NMM) STANDARD TIME USED/HEURE NORMALE UTILISÉE: MOUNTAIN / DES ROCHEUSES

DATE	TEMPERATURE / TEMPÉRATURE			DEGREE-DAYS / DEGRÉS-JOURS			REL. HUMIDITY / HUMIDITÉ REL.		THUNDERSTORM / ORAGE	PRECIPITATION / PRÉCIPITATIONS			SNOW ON GROUND / NEIGE AU SOL	WIND / VENT			BRIGHT SUNSHINE / INSOLATION EFFECTIVE
	MAXIMUM / MAXIMALE °C	MINIMUM / MINIMALE °C	MEAN / MOYENNE °C	HEATING / DE CHAUFFE BASE 18.0°C	GROWING / DE CROISSANCE BASE 5.0°C	COOLING / DE RÉFRIGÉRATION BASE 18.0°C	MAXIMUM / MAXIMALE %	MINIMUM / MINIMALE %		RAINFALL / PLUIE (HAUTEUR) mm	SNOWFALL / NEIGE (HAUTEUR) cm	TOTAL PRECIP / PRÉCIP TOTALE mm	cm	AVERAGE SPEED / VITESSE MOYENNE km/h	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE ET DIRECTION MAX SUR 2 MIN & DIRECTION km/h	HOURS / HEURES
1	8.9	-0.3	4.3	13.7			87	49		0.4		0.4		6.4	ESE	NW 22*	5.8
2	9.2	-0.9	4.2	13.8			93	60						9.4	ENE	ENE 22	2.0
3	0.7	-2.7	-1.0	19.0			93	69			TR	TR		9.7	NE	NE 24	0.5
4	9.6	-1.3	4.2	13.8			93	57		0.4	TR	0.4		6.1	SW	W 11	4.9
5	8.4	-2.8	2.8	15.2			75	42		0.2		0.2		12.9	SW	SW 22	0.7
6	8.5	-0.1	4.2	13.8			87	53		TR	TR	TR		17.6	WNW	WNW 41	2.5
7	5.3	-3.9	0.7	17.3			86	38			0.2	0.2	TR	27.5	WNW	WNW 39*	5.3
8	1.5	-6.5	-2.5	20.5			86	64						8.3	W	W 13*	8.3
9	0.7	-9.7	-4.5	22.5			100	69			TR	TR		6.1	ESE	SSE 13*	6.5
10	-4.0	-9.0	-6.5	24.5			100	79			TR	TR		8.0	SSE	NNW 17*	1.4
11	-4.0	-7.4	-5.7	23.7			100	80			0.2	0.2		10.0	WNW	NW 17*	0.1
12	-4.4	-9.9	-7.2	25.2			100	92			3.2	3.2	TR	7.7	ENE*	E 17	0.0
13	-3.9	-9.0	-6.5	24.5			100	79			TR	TR	3	8.9	NNW	NNW 20	0.4
14	-2.7	-7.5	-5.1	23.1			100	80			0.2	0.2	3	8.6	SSE	S 15*	0.0
15	-3.7	-9.2	-6.5	24.5			93	85					3	9.5	SSW	S 17	2.0
16	0.8	-11.5	-5.4	23.4			92	55					3	4.0	SSW	SSW 9	7.5
17	-6.3	-10.8	-8.6	26.6			92	85			0.4	0.4	3	9.3	NNW	NNW 22*	0.0
18	-2.8	-10.0	-6.4	24.4			92	74			TR	TR	2	8.1	S	S 15*	2.9
19	0.2	-9.2	-4.5	22.5			86	59					2	6.8	S	S 13*	5.2
20	-0.6	-8.3	-4.5	22.5			100	73					2	7.1	S	SSE 19*	3.2
21	1.5	-9.4	-4.0	22.0			86	59					2	15.1	S	SSE 30	3.5
22	2.7	-7.6	-2.5	20.5			92	59					2	9.1	ESE	ESE 22	6.8
23	4.6	-7.6	-1.5	19.5			93	51					2	10.0	W	W 20	4.5
24	0.9	-6.9	-3.0	21.0			93	55					1	10.5	S	S 22	5.2
25	-5.8	-15.4	-10.6	28.6			93	66			TR	TR	1	16.5	NNW	NNW 20*	0.4
26	-14.7	-18.0	-16.4	34.4			78	65			TR	TR	1	10.4	N	N 20	0.0
27	-7.2	-17.8	-12.5	30.5			79	66					1	14.6	SSE	SSE 24*	0.5
28	3.4	-9.7	-3.2	21.2			85	48					1	16.3	WNW	WNW 41	2.0
29	4.7	-4.4	0.2	17.8			74	51					1	10.4	SW	W 15*	0.0
30	10.4	0.5	5.5	12.5	0.5		60	34					1	13.5	WSW	WSW 24	4.4
31																	
MEAN / MOYENNE	0.7	-7.5	-3.4	TOTAL 642.5	TOTAL 0.5	TOTAL 0.0	90	63	TOT 0	TOTAL 1.0	TOTAL 4.2	TOTAL 5.2		10.6	PREVAILING S DOMINANTE	MAXIMALE WNW 41*	TOTAL 86.5
NORMAL / NORMALE	0.4	-7.8	-3.7	650.6	4.2	0.0			0	2.5	15.4	15.7		13.5	S		107.2

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C / AU-DESSOUS DE 18°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE	ABOVE 5°C / AU-DESSUS DE 5°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	642.5	507.3	650.6	TOTAL FOR MONTH / TOTAL DU MOIS	0.5	3.4	4.2
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	1301.3	1168.7	1367.6	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	1738.5	1694.6	1557.1

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRÉCIPITATIONS TOTALES

0.2 mm OR MORE / OU PLUS	1.0 mm OR MORE / OU PLUS	2.0 mm OR MORE / OU PLUS	10.0 mm OR MORE / OU PLUS	50.0 mm OR MORE / OU PLUS
8	1	1	0	0

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE

0.2 cm OR MORE / OU PLUS	1.0 cm OR MORE / OU PLUS	2.0 cm OR MORE / OU PLUS	10.0 cm OR MORE / OU PLUS	50.0 cm OR MORE / OU PLUS
5	1	1	0	0

Environment Canada / Environnement Canada

Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS DECEMBER/DECEMBRE 1988

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 °34 N LONG 113 °31 W ELEVATION/ALTITUDE 671 METRES (ASL) / METRES (NMM) STANDARD TIME USED / HEURE NORMALE UTILISÉE MOUNTAIN / DES ROCHEUSES

DATE	TEMPERATURE / TEMPERATURE			DEGREE-DAYS / DEGRÉS-JOURS			REL. HUMIDITY / HUMIDITÉ REL.		THUNDERSTORM / ORAGE	PRECIPITATION / PRÉCIPITATIONS			SNOW ON GROUND / NEIGE AU SOL	WIND / VENT			BRIGHT SUNSHINE / INSOLATION EFFECTIVE
	MAXIMUM / MAXIMALE °C	MINIMUM / MINIMALE °C	MEAN / MOYENNE °C	HEATING / DE CHAUFFE BASE 18.0°C	GROWING / DE CROISSANCE BASE 5.0°C	COOLING / DE RÉFRIGÉRATION BASE 18.0°C	MAXIMUM / MAXIMALE %	MINIMUM / MINIMALE %		RAINFALL / PLUIE (HAUTEUR) mm	SNOWFALL / NEIGE (HAUTEUR) cm	TOTAL PRECIP / PRÉCIP TOTALE mm	SNOW ON GROUND / NEIGE AU SOL cm	AVERAGE SPEED / VITESSE MOYENNE km/h	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION km/h	HOURS / HEURES
1	7.5	-4.0	1.8	16.2			69	41					TR	5.8	S	S 15	2.3
2	3.5	-5.6	-1.1	19.1			80	44					TR	14.6	NW	NW 33*	6.7
3	1.4	-9.0	-3.8	21.8			69	54					TR	10.6	S	SSE 26	0.9
4	8.9	-1.5	3.7	14.3			69	49					TR	6.0	SSW	SW 13*	3.6
5	7.0	-4.2	1.4	16.6			81	43		TR		TR	0	9.3	WNW	WNW 20	0.3
6	-2.3	-9.2	-5.8	23.8			86	50					0	13.0	WNW	WNW 22*	6.9
7	-8.8	-16.5	-12.7	30.7			78	56					0	6.9	NNE	WNW 15*	4.4
8	-6.9	-17.2	-12.1	30.1			92	55			2.8	1.8	0	13.0	SSE	SSE 20	0.0
9	-4.1	-10.1	-7.1	25.1			93	85			TR	TR	2	6.2	S	S 13	0.0
10	3.7	-8.7	-2.5	20.5			93	56		TR	0.4	0.2	2	13.8	W	WNW 32	0.7
11	4.4	-4.4	0.0	18.0			81	55		TR		TR	1	9.8	W*	W 22	0.0
12	5.7	-3.2	1.3	16.7			81	49		TR		TR	1	10.9	W	W 22	6.3
13	0.8	-6.1	-2.7	20.7			80	69					1	11.8	WNW	WNW 20	1.5
14	-5.1	-7.4	-6.3	24.3			79	73			TR	TR	1	13.5	WNW*	NW 28	0.0
15	3.0	-7.2	-2.1	20.1			73	52					1	16.4	WSW	WNW 28*	5.4
16	4.0	-5.2	-0.6	18.6			59	35					1	9.3	W	W 22	6.9
17	6.1	-4.4	0.9	17.1			64	45					TR	8.7	WSW	W 19	0.0
18	3.2	-2.5	0.4	17.6			87	64		1.0		1.0	TR	7.0	W	NNW 20	0.0
19	0.3	-6.2	-3.0	21.0			86	68			TR	TR	TR	16.1	W	NNW 28	1.6
20	-3.6	-12.1	-7.9	25.9			85	63					TR	6.2	SSW	SSW 11*	7.1
21	-7.6	-15.0	-11.3	29.3			92	67					TR	3.8	SSW	SSW 7*	2.6
22	-6.1	-12.0	-9.1	27.1			93	73			TR	TR	TR	2.7	S*	W 7*	0.0
23	-6.4	-9.2	-7.8	25.8			92	85			TR	TR	TR	10.1	SSE*	SE 15*	0.0
24	-9.1	-16.6	-12.9	30.9			92	85			0.4	0.4	TR	8.2	SSE	ESE 13	0.4
25	-12.0	-19.1	-15.6	33.6			92	84			TR	TR	1	6.9	S	SSE 13*	6.0
26	-11.3	-21.8	-16.6	34.6			92	72			TR	TR	1	8.6	S	S 15	4.7
27	-11.2	-18.9	-15.1	33.1			92	67			0.2	TR	1	6.6	NE	NE 13*	0.1
28	-5.8	-17.0	-11.4	29.4			92	71			0.6	0.6	1	8.8	S	S 15*	0.1
29	-1.0	-11.9	-6.5	24.5			100	79			2.2	1.6	1	4.8	NNE	WNW 13	0.1
30	-11.6	-19.1	-15.4	33.4			92	71			6.6	6.6	3	14.3	NE	NNW 19	0.0
31	-18.8	-24.1	-21.5	39.5			77	64			2.2	1.8	10	10.1	NNW	N 22*	1.1
MEAN / MOYENNE	-2.3	-10.6	-6.5	TOTAL 759.4	TOTAL 0.0	TOTAL 0.0	84	62	TOT 0	TOTAL 1.0	TOTAL 15.4	TOTAL 14.0		9.5	PREVAILING W DOMINANTE	MAXIMALE NW 33*	TOTAL 69.7
NORMAL / NORMALE	-6.2	-14.5	-10.4	880.0	0.2	0.0			0	1.4	27.1	24.7		13.0	S		77.9

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C / AU-DESSOUS DE 18°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE	ABOVE 5°C / AU-DESSUS DE 5°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	759.4	683.5	880.0	TOTAL FOR MONTH / TOTAL DU MOIS	0.0	0.0	0.2
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	2060.7	1852.2	2247.6	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	1738.5	1694.6	1557.3

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRÉCIPITATIONS TOTALES (mm OR MORE / OU PLUS): 0.2 — 1.0 — 2.0 — 10.0 — 20.0

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE (cm OR MORE / OU PLUS): 0.2 — 1.0 — 2.0 — 10.0 — 20.0

0.2 mm	1.0 mm	2.0 mm	10.0 mm	20.0 mm	0.2 cm	1.0 cm	2.0 cm	10.0 cm	20.0 cm
8	5	1	0	0	8	4	4	0	0

Environment Canada / Environnement Canada
Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS JANUARY/JANVIER 19 89

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 ·34 'N LONG. 113 ·31 'W ELEVATION ALTITUDE 671 METRES (ASL) METRES (NMM) STANDARD TIME USED: MOUNTAIN HEURE NORMALE UTILISÉE: DES ROCHEUSES

DATE	TEMPERATURE TEMPERATURE			DEGREE-DAYS DEGRÉS-JOURS			REL. HUMIDITY HUMIDITÉ REL.		THUNDERSTORM ORAGE	PRECIPITATION PRECIPITATIONS			SNOW ON GROUND NEIGE AU SOL	WIND VENT			BRIGHT SUNSHINE INSOLATION EFFECTIVE
	MAXIMUM MAXIMALE °C	MINIMUM MINIMALE °C	MEAN MOYENNE °C	HEATING DE CHAUFFE BASE 18.0°C	GROWING DE CROISSANCE BASE 5.0°C	COOLING DE RÉFRIGÉRATION BASE 18.0°C	MAXIMUM MAXIMALE %	MINIMUM MINIMALE %		RAINFALL PLUIE (HAUTEUR) mm	SNOWFALL NEIGE (HAUTEUR) cm	TOTAL PRECIP. PRÉCIP. TOTALE mm	cm	AVERAGE SPEED VITESSE MOYENNE km/h	PREVAILING DIRECTION DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION VITESSE MOYENNE MAX. & DIRECTION km/h	HOURS HEURES
1	-6.5	-23.2	-14.9	32.9			93	56			TR	TR	10	9.3	S	SSE 15	3.7
2	-1.8	-7.2	-4.5	22.5			93	63					10	17.1	WNW	WNW 37	2.1
3	-2.8	-8.7	-5.8	23.8			86	58					10	6.7	S	W 15	0.0
4	-0.6	-8.9	-4.8	22.8			93	69					10	7.7	WSW	WSW 13	2.6
5	-8.0	-16.5	-12.3	30.3			92	71			1.8	1.2	10	14.5	NNE	NNE 19*	0.0
6	-16.5	-21.2	-18.9	36.9			77	65			1.9	1.9	12	8.6	N	NNE 15*	2.1
7	-19.5	-27.1	-23.3	41.3			77	69			TR	TR	13	5.3	SSW*	SSE 13	4.6
8	-24.6	-30.2	-27.4	45.4			76	62			TR	TR	13	5.5	S	S 15	0.0
9	-20.4	-29.9	-25.2	43.2			76	62			TR	TR	13	1.5	ENE	ENE 6*	4.8
10	-10.7	-25.0	-17.9	35.9			92	69			TR	TR	13	4.9	WSW	SSW 9*	2.4
11	-3.4	-12.8	-8.1	26.1			79	58					12	11.8	W	W 17*	6.5
12	4.7	-10.3	-2.8	20.8			93	48			0.4	0.4	12	14.2	S	SSW 22	0.0
13	5.2	-8.0	-1.4	19.4			93	41			TR	TR	12	10.1	W	SSW 20	0.1
14	-7.0	-13.0	-10.0	28.0			100	79			0.2	0.2	10	6.4	S	SSW 11*	2.7
15	-0.9	-13.9	-7.4	25.4			93	53			1.2	0.6	10	11.2	SSW	W 22	0.5
16	-1.0	-7.2	-4.1	22.1			73	54					10	15.6	SSE	SE 28*	0.1
17	2.3	-7.5	-2.6	20.6			86	47					10	14.8	SSW	WNW 37	5.6
18	3.3	-5.2	-1.0	19.0			74	38			TR	TR	10	19.5	W	W 35	3.0
19	-0.2	-6.9	-3.6	21.6			62	47					9	12.5	S	S 20	6.2
20	6.5	-6.5	0.0	18.0			86	49					9	9.8	SSW	NNW 30	4.7
21	1.8	-7.8	-3.0	21.0			74	55					8	10.4	SW*	S 15*	1.8
22	-3.2	-14.3	-8.8	26.8			92	50					8	7.2	W*	W 19	7.0
23	-6.0	-15.2	-10.6	28.6			92	45					8	8.4	S	S 19	8.0
24	-4.4	-14.6	-9.5	27.5			78	45					8	11.7	S	SSE 24	6.3
25	3.9	-10.5	-3.3	21.3			69	51			TR	TR	8	11.8	SSW	S 19*	0.9
26	10.2	0.6	5.4	12.6	0.4		61	37					8	10.1	SSW	WSW 26	0.4
27	10.7	-3.7	3.5	14.5			75	34					5	17.2	NW*	NW 37	7.4
28	7.8	-4.8	1.5	16.5			74	42					4	10.0	SSW	WSW 28	0.5
29	6.8	2.3	4.6	13.4			100	52		3.2		3.2	4	11.3	WSW	WSW 22	0.0
30	4.4	-27.6	-11.6	29.6			100	57		1.0	29.0	29.6	3	23.8	N	NNE 27*	0.0
31	-26.7	-33.7	-30.2	48.2			62	55			5.0	5.0	25	23.0	NNW	NNW 30	0.0
MEAN MOYENNE	-3.1	-13.5	-8.3	TOTAL 816.0	TOTAL 0.4	TOTAL 0.0	83	54	TOT 0	TOTAL 4.2	TOTAL 39.5	TOTAL 42.1		11.3	PREVAILING DOMINANTE S	MAXIMUM	TOTAL 84.0
NORMAL NORMALE	-10.7	-19.2	-15.0	1021.5	0.1	0.0			0	1.4	27.2	24.6		13.0	S		90.0

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C AU-DESSOUS DE 18°C	THIS YEAR ANNÉE EN COURS	PREVIOUS YEAR ANNÉE PRÉCÉDENTE	NORMAL NORMALE	ABOVE 5°C AU-DESSUS DE 5°C	THIS YEAR ANNÉE EN COURS	PREVIOUS YEAR ANNÉE PRÉCÉDENTE	NORMAL NORMALE
TOTAL FOR MONTH TOTAL DU MOIS	816.0	900.2	1021.5	TOTAL FOR MONTH TOTAL DU MOIS	0.4	0.0	0.1
ACCUMULATED SINCE JULY 1 ACCUMULÉE DEPUIS LE 1er JUILLET	2876.7	2752.4	3269.1	ACCUMULATED SINCE APRIL 1 ACCUMULÉE DEPUIS LE 1er AVRIL	1738.9	1694.6	1557.4

DAYS WITH TOTAL PRECIPITATION JOURS AVEC PRÉCIPITATIONS TOTALES: (mm)

0.2 OR MORE OU PLUS	1.0 OR MORE OU PLUS	2.0 OR MORE OU PLUS	10.0 OR MORE OU PLUS	50.0 OR MORE OU PLUS
8	5	3	1	0

DAYS WITH SNOWFALL JOURS AVEC CHUTE DE NEIGE: (cm)

0.2 OR MORE OU PLUS	1.0 OR MORE OU PLUS	2.0 OR MORE OU PLUS	10.0 OR MORE OU PLUS	50.0 OR MORE OU PLUS
7	5	2	1	0

Environment Canada / Environnement Canada

Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS FEBRUARY/FEVRIER 1989

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 °34 N LONG. 113 °31 W ELEVATION ALTITUDE 671 METRES (ASL) MÈTRES (NMM) STANDARD TIME USED HEURE NORMALE UTILISÉE MOUNTAIN DES ROCHEUSES

DATE	TEMPERATURE TEMPERATURE			DEGREE-DAYS DEGRÉS-JOURS			REL. HUMIDITY HUMIDITÉ REL.		THUNDERSTORM ORAGE	PRECIPITATION PRÉCIPITATIONS			SNOW ON GROUND NEIGE AU SOL	WIND VENT			BRIGHT SUNSHINE INSOLATION EFFECTIVE
	MAXIMUM MAXIMALE	MINIMUM MINIMALE	MEAN MOYENNE	HEATING DE CHAUFFE	GROWING DE CROISSANCE	COOLING DE RÉFRIGÉRATION	MAXIMUM MAXIMALE	MINIMUM MINIMALE		RAINFALL PLUIE (HAUTEUR)	SNOWFALL NEIGE (HAUTEUR)	TOTAL PRECIP PRÉCIP. TOTALE		AVERAGE SPEED VITESSE MOYENNE	PREVAILING DIRECTION DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION	
	°C	°C	°C	BASE 18.0°C	BASE 5.0°C	BASE 18.0°C	%	%		mm	cm	mm	cm	km/h		km/h	HOURS HEURES
1	-31.8	-36.6	-34.2	52.2			67	50			TR	TR	26	15.0	NNW	NW 20*	6.9
2	-30.1	-36.8	-33.5	51.5			67	56			TR	TR	26	14.5	NNW	NW 20	6.0
3	-19.6	-33.0	-26.3	44.3			68	53			TR	TR	26	14.8	W	W 19*	5.2
4	-11.0	-21.9	-16.5	34.5			61	51					26	17.6	NNW	W 35	1.7
5	-7.2	-12.0	-9.6	27.6			78	37			0.4	0.4	26	23.8	NNW	NW 41	0.0
6	-4.0	-10.3	-7.2	25.2			67	42			TR	TR	26	20.0	NNW	NNW 37	8.2
7	-8.2	-18.3	-13.3	31.3			85	57			TR	TR	20	15.2	NW	NW 28*	3.3
8	-4.3	-20.6	-12.5	30.5			84	53					20	8.3	SSW	WSW 17	8.1
9	0.8	-8.2	-3.7	21.7			73	43					20	9.0	WSW	NNW 19	8.8
10	-1.3	-8.5	-4.9	22.9			73	46					19	10.0	W	NW 17	5.8
11	-0.8	-11.3	-6.1	24.1			72	50					17	10.7	SSW	SSW 17*	8.8
12	1.1	-6.4	-2.7	20.7			80	40			TR	TR	16	22.4	NNW	NNW 30*	3.0
13	-5.8	-13.0	-9.4	27.4			92	67			0.8	0.6	16	13.5	NNW	NNW 24	3.4
14	-11.7	-23.6	-17.7	35.7			92	50					17	10.1	E	NNW 15*	5.2
15	-20.6	-29.1	-24.9	42.9			69	44					17	6.5	E*	NE 11*	8.8
16	-18.1	-31.0	-24.6	42.6			75	41			TR	TR	17	2.5	SSW	SSW 7*	8.2
17	-18.0	-28.3	-23.2	41.2			69	49			TR	TR	17	10.0	S	S 19*	6.4
18	-12.6	-26.3	-19.5	37.5			65	47					17	8.8	SSW	SSW 17	9.6
19	-5.7	-20.9	-13.3	31.3			77	41					17	3.6	SSW	SSW 11*	9.4
20	-3.0	-16.2	-9.6	27.6			73	58			TR	TR	17	10.3	NW	NNW 22*	4.1
21	-3.6	-13.0	-8.3	26.3			92	63					17	7.5	S	S 20	9.6
22	-1.1	-9.8	-5.5	23.5			86	64					16	12.9	S	S 26	3.1
23	4.0	-8.7	-2.4	20.4			100	73		0.2	1.8	2.0	15	7.5	NNW	NNW 19	0.9
24	-1.1	-9.3	-5.2	23.2			93	73			TR	TR	16	12.5	NNW	NNE 20	0.0
25	-9.2	-17.0	-13.1	31.1			85	60			0.4	0.4	16	8.9	N	NNE 20	6.5
26	-2.6	-19.0	-10.8	28.8			100	71			5.2	5.2	16	13.7	S	N 26	0.7
27	-4.5	-17.5	-11.0	29.0			93	46			3.6	2.2	24	18.3	NNW	NNW 26*	8.0
28	-16.7	-22.8	-19.8	37.8			58	45					24	15.5	NNW	NNW 22	9.7
29																	
30																	
31																	
MEAN MOYENNE	-8.8	-18.9	-13.9	TOTAL 892.8	TOTAL 0.0	TOTAL 0.0	78	53	TOT 0	TOTAL 0.2	TOTAL 12.2	TOTAL 10.8		12.3	PREVAILING NNW DOMINANT	MAXIMUM NW 41	TOTAL 159.4
NORMAL NORMALE	-4.8	-14.3	-9.6	779.7	0.4	0.0			0	0.5	21.3	18.8		13.0	S		116.3

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C AU-DESSOUS DE 18°C	THIS YEAR ANNÉE EN COURS	PREVIOUS YEAR ANNÉE PRÉCÉDENTE	NORMAL NORMALE	ABOVE 5°C AU-DESSUS DE 5°C	THIS YEAR ANNÉE EN COURS	PREVIOUS YEAR ANNÉE PRÉCÉDENTE	NORMAL NORMALE
TOTAL FOR MONTH TOTAL DU MOIS	892.8	739.4	779.7	TOTAL FOR MONTH TOTAL DU MOIS	0.0	2.4	0.4
ACCUMULATED SINCE JULY 1 ACCUMULÉE DEPUIS LE 1er JUILLET	3769.5	3491.8	4048.8	ACCUMULATED SINCE APRIL 1 ACCUMULÉE DEPUIS LE 1er AVRIL	1738.9	1697.0	1557.8

DAYS WITH TOTAL PRECIPITATION JOURS AVEC PRÉCIPITATIONS TOTALES

mm	0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	50.0 OR MORE / OU PLUS
	6	3	3	0	0

DAYS WITH SNOWFALL JOURS AVEC CHUTE DE NEIGE

cm	0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	50.0 OR MORE / OU PLUS
	6	3	2	0	0

Environment Canada / Environnement Canada
Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS MARCH/MARS 1989

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 ·34 N LONG 113 ·31 W ELEVATION/ALTITUDE 671 METRES (ASL)/MÈTRES (NMM) STANDARD TIME USED/HEURE NORMALE UTILISÉE MOUNTAIN/DES ROCHEUSES

DATE	TEMPERATURE/TEMPÉRATURE MAXIMUM/MAXIMALE °C	MINIMUM/MINIMALE °C	MEAN/MOYENNE °C	DEGREE-DAYS/DEGRÉS-JOURS HEATING/DE CHAUFFE BASE 18°C	GROWING/DE CROISSANCE BASE 5°C	COOLING/DE RÉFRIGÉRATION BASE 18°C	REL HUMIDITY/HUMIDITÉ REL MAXIMUM/MAXIMALE %	MINIMUM/MINIMALE %	THUNDERSTORM/ORAGE	PRECIPITATION/PRÉCIPITATIONS RAINFALL/PLUIE (HAUTEUR) mm	SNOWFALL/NEIGE (HAUTEUR) cm	TOTAL PRECIP/PRÉCIP TOTALE mm	SNOW ON GROUND/NEIGE AU SOL cm	WIND/VENT AVERAGE SPEED/VITESSE MOYENNE km/h	PREVAILING DIRECTION/DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION/VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION km/h	BRIGHT SUNSHINE/INSOLATION EFFECTIVE HOURS/HEURES
1	-14.1	-24.1	-19.1	37.1			58	39					24	11.7	W	W 19	9.6
2	-12.2	-25.1	-18.7	36.7			64	43					24	8.1	SSW	S 15	9.6
3	-10.8	-23.6	-17.2	35.2			58	36					24	12.0	SSW	SSE 20*	9.3
4	-13.5	-20.6	-17.1	35.1			71	55					23	8.4	S	S 19	9.0
5	-9.2	-17.5	-13.4	31.4			78	56					22	14.5	ESE	SSE 22	6.4
6	-3.8	-11.9	-7.9	25.9			92	63			0.4	0.4	21	8.0	ENE	NW 19	8.4
7	-0.6	-12.0	-6.3	24.3			92	46			0.6	0.4	21	12.5	WSW*	W 24*	9.7
8	2.2	-7.6	-2.7	20.7			73	55					20	14.8	S	S 22*	7.6
9	1.2	-8.1	-3.5	21.5			79	54					19	12.7	NNE	NNE 24*	3.3
10	-7.8	-19.2	-13.5	31.5			92	54		TR	0.4	0.4	19	18.5	NW	NNE 26	3.6
11	-16.0	-21.9	-19.0	37.0			77	59			3.9	3.9	19	7.4	N	N 13*	2.9
12	-11.2	-20.1	-15.7	33.7			77	55			TR	TR	22	6.6	W	NW 11*	8.0
13	-5.7	-16.8	-11.3	29.3			85	62			0.2	0.2	22	11.0	NW	NW 22	8.2
14	-6.2	-11.1	-8.7	26.7			92	62			0.2	0.2	22	7.9	N	N 19	1.6
15	-10.2	-16.0	-13.1	31.1			92	43			0.8	0.8	22	19.9	NW	NW 30	8.5
16	-11.8	-20.8	-16.3	34.3			71	36					22	6.5	NW	NW 17	10.3
17	-10.1	-22.4	-16.3	34.3			77	48			TR	TR	22	9.8	S	S 22*	9.8
18	-8.2	-20.9	-14.6	32.6			77	52					22	6.3	S	S 17*	9.6
19	-5.5	-14.1	-9.8	27.8			79	61			TR	TR	22	3.7	ENE	S 9	2.7
20	-5.0	-12.4	-8.7	26.7			79	62					21	6.6	S	S 11*	9.6
21	-1.2	-11.3	-6.3	24.3			86	63					20	12.6	SE	S 22*	7.7
22	1.5	-10.2	-4.4	22.4			93	75			TR	TR	19	8.6	S	SSW 17	3.8
23	6.7	-6.1	0.3	17.7			93	39					18	8.0	WSW	W 17	8.6
24	5.2	-1.2	2.0	16.0			86	53			TR	TR	16	13.0	SSE	NW 19*	8.3
25	1.4	-5.4	-2.0	20.0			100	64			0.4	0.4	14	9.9	E	SSE 17	0.0
26	-2.0	-7.6	-4.8	22.8			93	80			TR	TR	14	11.3	ENE	NW 19	0.0
27	0.1	-3.7	-1.8	19.8			100	93		0.2	TR	0.2	14	15.8	E	ESE 26	0.0
28	-0.6	-4.5	-2.6	20.6			100	86		TR	0.2	0.2	14	6.3	NNE	E 11*	0.0
29	7.5	-7.4	0.1	17.9			100	39					14	8.5	SSW	W 19*	9.7
30	9.7	-3.3	3.2	14.8			74	34					13	12.5	S	S 22	11.7
31	8.3	-2.9	2.7	15.3			80	46					11	12.9	W*	NW 28	10.9
MEAN/MOYENNE	-3.9	-13.2	-8.6	TOTAL 824.5	TOTAL 0.0	TOTAL 0.0	83	55	TOT 0	TOTAL 0.2	TOTAL 7.1	TOTAL 7.1		10.5	PREVAILING/DOMINANTE S	MAXIMUM NW 30	TOTAL 208.4
NORMAL/NORMALE	-0.3	-9.7	-5.0	713.7	2.6	0.0			0	1.6	18.7	18.5		13.8	S		167.5

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C/AU-DESSOUS DE 18°C	THIS YEAR/ANNÉE EN COURS	PREVIOUS YEAR/ANNÉE PRÉCÉDENTE	NORMAL/NORMALE	ABOVE 5°C/AU-DESSUS DE 5°C	THIS YEAR/ANNÉE EN COURS	PREVIOUS YEAR/ANNÉE PRÉCÉDENTE	NORMAL/NORMALE
TOTAL FOR MONTH/TOTAL DU MOIS	824.5	487.5	713.7	TOTAL FOR MONTH/TOTAL DU MOIS	0.0	7.7	2.6
ACCUMULATED SINCE JULY 1/ACCUMULÉE DEPUIS LE 1er JUILLET	4594.0	3979.3	4762.5	ACCUMULATED SINCE APRIL 1/ACCUMULÉE DEPUIS LE 1er AVRIL	1738.9	1704.7	1560.4

DAYS WITH TOTAL PRECIPITATION/JOURS AVEC PRÉCIPITATIONS TOTALES

0.2 mm OR MORE/OU PLUS	1.0 mm OR MORE/OU PLUS	2.0 mm OR MORE/OU PLUS	5.0 mm OR MORE/OU PLUS	10.0 mm OR MORE/OU PLUS	25.0 mm OR MORE/OU PLUS	50.0 mm OR MORE/OU PLUS	100.0 mm OR MORE/OU PLUS
10	1	1	0	0	0	0	0

DAYS WITH SNOW ON GROUND/JOURS AVEC NEIGE AU SOL

1 cm OR MORE/OU PLUS	5 cm OR MORE/OU PLUS	10 cm OR MORE/OU PLUS	20 cm OR MORE/OU PLUS	30 cm OR MORE/OU PLUS	40 cm OR MORE/OU PLUS
9	1	1	0	0	0

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MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS APRIL/AVRIL 1989

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 34 N LONG 113 31 W ELEVATION/ALTITUDE 671 METRES (ASL) / METRES (NMM) STANDARD TIME USED/HEURE NORMALE UTILISÉE MOUNTAIN/DES ROCHEUSES

DATE	TEMPERATURE / TEMPERATURE			DEGREE-DAYS / DEGRÉS-JOURS			REL HUMIDITY / HUMIDITÉ REL		THUNDERSTORM / ORAGE	PRECIPITATION / PRÉCIPITATIONS			SNOW ON GROUND / NEIGE AU SOL	WIND / VENT			BRIGHT SUNSHINE / INSOLATION EFFECTIVE
	MAXIMUM / MAXIMALE	MINIMUM / MINIMALE	MEAN / MOYENNE	HEATING / DE CHAUFFE	COOLING / DE CROISSANCE	COOLING / DE RÉFRIGÉRATION	MAXIMUM / MAXIMALE	MINIMUM / MINIMALE		RAINFALL / PLUIE	SNOWFALL / NEIGE	TOTAL PRECIP / PRÉCIP TOTALE		AVERAGE SPEED / VITESSE MOYENNE	PREVAILING DIRECTION / DIRECTION DOMINANTE	MAX 2 MIN MEAN SPEED & DIRECTION / VITESSE MOYENNE MAXIMALE EN 2 MIN & DIRECTION	
	°C	°C	°C	BASE 18°C	BASE 18°C	BASE 18°C	%	%		mm	cm	cm	cm	km/h		km/h	HOURS / HEURES
1	8.5	-1.6	3.5	14.5			69	36					8	12.4	NW	S 17	11.8
2	9.8	-2.0	3.9	14.1			80	32					6	9.4	SE	SE 15*	10.0
3	7.8	-0.3	3.8	14.2			93	45		0.4	TR	0.4	5	11.3	NW	NW 20	7.3
4	9.4	-1.4	4.0	14.0			80	34					4	11.8	W	NW 22	10.6
5	7.5	-2.7	2.4	15.6			80	42					2	7.4	NW*	NW 19	3.2
6	8.9	-3.6	2.7	15.3			86	36					1	7.2	S	S 19	8.2
7	5.4	-2.7	1.4	16.6			93	48			2.6	2.6	1	10.4	NE	N 19*	4.2
8	4.2	-6.7	-1.3	19.3			79	38					TR	9.3	W*	NW 19	7.5
9	7.7	-3.9	1.9	16.1			86	36					TR	7.7	SE	NW 15	11.6
10	12.6	-3.4	4.6	13.4			80	24						4.0	SW	SW 15	12.5
11	17.2	-0.8	8.2	9.8	3.2		69	20						8.6	SW	SW 15*	12.3
12	14.8	3.6	9.2	8.8	4.2		61	21						17.7	W	NW 44	8.9
13	12.1	-0.6	5.8	12.2	0.8		69	28						11.5	N	N 25	12.6
14	17.4	-1.2	8.1	9.9	3.1		74	34						12.5	S	S 28	10.4
15	11.5	-2.5	4.5	13.5			87	40		2.8	0.2	3.0		27.0	NW	NW 37*	8.3
16	-1.2	-13.0	-7.1	25.1			86	31			2.0	2.0	TR	18.0	N	NNE 28	13.4
17	11.0	-6.1	2.5	15.5			79	19						11.5	NW	NW 26	13.3
18	17.6	-1.9	7.9	10.1	2.9		64	17						8.9	S	NW 22	13.0
19	17.3	-1.7	7.8	10.2	2.8		69	29						9.0	ESE	ESE 17*	6.0
20	21.4	4.9	13.2	4.8	8.2		56	25						10.4	S	S 22	5.8
21	17.6	7.2	12.4	5.6	7.4		76	32		0.8		0.8		13.0	W	NW 28*	8.2
22	9.9	0.6	5.3	12.7	0.3		93	56		0.2	0.4	0.6		14.0	NNE	NNE 24	0.5
23	7.6	-0.5	3.6	14.4			93	49		0.6	2.6	3.2	2	7.5	NW	NW 19*	4.2
24	12.7	-0.8	6.0	12.0	1.0		80	32						6.2	SW	N 13*	11.7
25	13.4	-1.8	5.8	12.2	0.8		69	18						7.5	E	E 19	13.4
26	12.6	-1.0	5.8	12.2	0.8		69	30						9.0	ESE	ESE 20	10.6
27	15.2	0.7	8.0	10.0	3.0		75	29						6.2	ESE	ESE 17	13.8
28	18.7	1.6	10.2	7.8	5.2		64	22						5.4	SW	NE 9*	13.3
29	20.0	2.8	11.4	6.6	6.4		52	22						9.3	SE	SE 19	13.9
30	20.7	5.6	13.2	4.8	8.2		42	17						17.6	S*	SE 24*	12.2
31																	
MEAN / MOYENNE	12.3	-1.1	5.6	TOTAL 371.3	TOTAL 58.3	TOTAL 0.0	75	31	TOT 0	TOTAL 4.8	TOTAL 7.8	TOTAL 12.6		10.7	PREVAILING DOMINANTE S	MAXIMALE NW 44	TOTAL 292.7
NORMAL / NORMALE	9.6	-1.2	4.2	413.4	50.5	0.3			0	8.8	13.2	21.7		15.5	S		228.3

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 18°C / AU-DESSOUS DE 18°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE	ABOVE 18°C / AU-DESSUS DE 18°C	THIS YEAR / ANNÉE EN COURS	PREVIOUS YEAR / ANNÉE PRÉCÉDENTE	NORMAL / NORMALE
TOTAL FOR MONTH / TOTAL DU MOIS	371.3	321.2	413.4	TOTAL FOR MONTH / TOTAL DU MOIS	58.3	82.2	50.5
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	4965.3	4300.5	5175.9	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	58.3	82.2	50.5

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRÉCIPITATIONS TOTALES

0.2 mm OR MORE / OU PLUS	1.0 mm OR MORE / OU PLUS	2.0 mm OR MORE / OU PLUS	5.0 mm OR MORE / OU PLUS	10.0 mm OR MORE / OU PLUS	20.0 mm OR MORE / OU PLUS	30.0 mm OR MORE / OU PLUS	50.0 mm OR MORE / OU PLUS
7	4	4	0	0	5	3	3

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE

0.2 cm OR MORE / OU PLUS	1.0 cm OR MORE / OU PLUS	2.0 cm OR MORE / OU PLUS	5.0 cm OR MORE / OU PLUS
3	3	0	0

Environment Canada / Environnement Canada
Atmospheric Environment Service / Service de l'environnement atmosphérique

MONTHLY METEOROLOGICAL SUMMARY
SOMMAIRE MÉTÉOROLOGIQUE MENSUEL

MONTH/MOIS MAY/MAI 1989

AT/À EDMONTON MUNICIPAL AIRPORT, ALBERTA
AEROPORT MUNICIPAL D'EDMONTON

LAT 53 34 N LONG 113 31 W ELEVATION/ALTITUDE 671 METRES (ASL) / METRES (NMM) STANDARD TIME USED/HEURE NORMALE UTILISÉE MOUNTAIN / DES ROCHEUSES

DATE	TEMPERATURE/TEMPÉRATURE MAXIMUM MAXIMALE °C	TEMPERATURE/TEMPÉRATURE MINIMUM MINIMALE °C	TEMPERATURE/TEMPÉRATURE MEAN MOYENNE °C	DEGREE-DAYS/DEGRÉS-JOURS HEATING/DE CHAUFFE BASE 18°C	DEGREE-DAYS/DEGRÉS-JOURS GROWING/DE CROISSANCE BASE 5°C	DEGREE-DAYS/DEGRÉS-JOURS COOLING/DE RÉFRIGÉRATION BASE 18°C	REL HUMIDITY/HUMIDITÉ REL MAXIMUM MAXIMALE %	REL HUMIDITY/HUMIDITÉ REL MINIMUM MINIMALE %	THUNDERSTORM/ORAGE	PRECIPITATION/PRÉCIPITATIONS RAINFALL/PLUIE (HAUTEUR) mm	PRECIPITATION/PRÉCIPITATIONS SNOWFALL/NEIGE (HAUTEUR) cm	PRECIPITATION/PRÉCIPITATIONS TOTAL PRECIP/PRÉCIP TOTALE mm	SNOW ON GROUND/NEIGE AU SOL cm	WIND/VENT AVERAGE SPEED/VITESSE MOYENNE km/h	WIND/VENT PREVAILING DIRECTION/DIRECTION DOMINANTE	WIND/VENT MAX 2 MIN MEAN SPEED & DIRECTION/VITESSE MOYENNE MAX SUR 2 MIN & DIRECTION km/h	BRIGHT SUNSHINE/INSOLATION EFFECTIVE HOURS/HEURES
1	17.8	4.7	11.3	6.7	6.3		57	26		TR		TR		13.8	S	NE 28	2.1
2	10.2	3.3	6.8	11.2	1.8		81	61		TR		TR		9.2	N	N 19	1.4
3	19.0	2.3	10.7	7.3	5.7		81	26		TR		TR		18.8	NW	NW 52	10.0
4	14.1	4.9	9.5	8.5	4.5		76	28		TR		TR		14.0	NNW	NNW 20*	7.0
5	24.8	3.3	14.1	3.9	9.1		52	20						17.4	S	S 26	12.7
6	22.0	8.1	15.1	2.9	10.1		59	31		TR		TR		13.6	W	NNW 26	7.2
7	22.2	9.0	15.6	2.4	10.6		71	30		TR		TR		11.2	NW	NW 24	10.8
8	24.8	7.0	15.9	2.1	10.9		66	20						8.0	SSW*	SSW 15*	14.6
9	27.4	11.4	19.4		14.4	1.4	50	20						18.9	S	S 30	12.5
10	26.8	11.6	19.2		14.2	1.2	82	32		0.8		0.8		23.7	SSE	NNW 33	9.8
11	17.7	6.9	12.3	5.7	7.3		87	29		2.6		2.6		20.2	NNW	NNW 30	5.8
12	16.8	4.2	10.5	7.5	5.5		81	25		0.6		0.6		12.0	NW	NNE 20*	13.9
13	17.4	1.9	9.7	8.3	4.7		65	22						5.1	NNW	N 11*	14.6
14	20.5	5.0	12.8	5.2	7.8		65	21						5.9	SE	SE 17	10.0
15	23.0	9.6	16.3	1.7	11.3		54	20						9.6	SSW	S 15*	9.4
16	22.0	9.4	15.7	2.3	10.7		72	26		2.0		2.0		11.8	NNW	SW 28	9.5
17	16.2	7.3	11.8	6.2	6.8		93	41		8.2		8.2		9.0	N	NW 20	8.0
18	15.4	7.3	11.4	6.6	6.4		76	50		TR		TR		17.6	E	NNW 37	0.7
19	7.4	0.2	3.8	14.2			100	87		23.8	11.2	35.0		27.3	NW	NW 46*	0.0
20	7.0	1.9	4.5	13.5			93	70		5.2	TR	5.2		26.9	NNW	NNW 44	0.1
21	9.0	2.2	5.6	12.4	0.6		87	53		TR	0.2	0.2		20.5	NNW	NW 33	9.0
22	7.3	0.6	4.0	14.0			100	52		0.2	2.8	3.0		14.5	NNW*	NNW 26*	2.7
23	9.2	-0.9	4.2	13.8			93	53		5.2		5.2		7.1	SSW	SE 19*	5.6
24	11.9	1.6	6.8	11.2	1.8		100	50		4.2	TR	4.2		12.9	N	N 24	3.5
25	15.2	2.0	8.6	9.4	3.6		87	31						8.2	N	NNE 13*	14.5
26	17.4	4.3	10.9	7.1	5.9		87	36		0.2		0.2		11.7	SSW	W 20	10.2
27	10.6	3.1	6.9	11.1	1.9		87	29						14.9	N	N 22	9.5
28	14.6	0.0	7.3	10.7	2.3		69	24						6.3	S	S 13*	15.9
29	20.1	2.5	11.3	6.7	6.3		70	18						10.6	SSW	SW 19	13.4
30	18.5	8.7	13.6	4.4	8.6		71	22						10.7	N	N 20	12.4
31	23.0	8.2	15.6	2.4	10.6		88	32		1.0		1.0		12.6	S	NNE 26	8.2
MEAN/MOYENNE	17.1	4.9	11.0	TOTAL 219.4	TOTAL 189.7	TOTAL 2.6	77	35	TOT 0	TOTAL 54.0	TOTAL 14.2	TOTAL 68.2		13.7	PREVAILING DIRECTION/DIRECTION DOMINANTE NW	MAXIMUM GUST/RAFALE MAXIMALE NW 52	TOTAL 255.0
NORMAL/NORMALE	17.2	5.4	11.3	209.1	201.9	2.8			2	39.4	3.1	42.5		16.1	S		277.6

DEGREE-DAY SUMMARY/SOMMAIRE DE DEGRÉS JOURS

BELOW 5°C / AU-DESSOUS DE 5°C	This year / Année en cours	Previous year / Année précédente	Normal / Normale	ABOVE 5°C / AU-DESSUS DE 5°C	This year / Année en cours	Previous year / Année précédente	Normal / Normale
TOTAL FOR MONTH / TOTAL DU MOIS	219.4	137.7	209.1	TOTAL FOR MONTH / TOTAL DU MOIS	189.7	270.0	201.9
ACCUMULATED SINCE JULY 1 / ACCUMULÉE DEPUIS LE 1er JUILLET	5184.7	4438.2	5385.0	ACCUMULATED SINCE APRIL 1 / ACCUMULÉE DEPUIS LE 1er AVRIL	248.0	352.2	252.4

DAYS WITH TOTAL PRECIPITATION / JOURS AVEC PRÉCIPITATIONS TOTALES (mm)

0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.0 OR MORE / OU PLUS	5.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	15.0 OR MORE / OU PLUS	20.0 OR MORE / OU PLUS	25.0 OR MORE / OU PLUS	50.0 OR MORE / OU PLUS	100.0 OR MORE / OU PLUS
12	9	8	1	0	3	2	2	1	0

DAYS WITH SNOWFALL / JOURS AVEC CHUTE DE NEIGE (cm)

0.2 OR MORE / OU PLUS	1.0 OR MORE / OU PLUS	2.0 OR MORE / OU PLUS	5.0 OR MORE / OU PLUS	10.0 OR MORE / OU PLUS	15.0 OR MORE / OU PLUS	20.0 OR MORE / OU PLUS	25.0 OR MORE / OU PLUS	50.0 OR MORE / OU PLUS	100.0 OR MORE / OU PLUS

APPENDIX B:
Air Leakage
Test Reports

Standard Air Leakage Test Report

JUL 2 5 1989

Canadian Home Builders' Association
Association canadienne des constructeurs d'habitations

R-2000

Can-Cell Industries
Builder/Company Name

16155-113 Avenue
Address

Edmonton Alta
City Province

EQUIPMENT MANUFACTURER Ener-Corp Inc.

TYPE OF EQUIPMENT Infiltrometer

FLOW MEASURING TECHNIQUE - NOZZLE - 1 [X] FAN SPEED - 2 [ ] ORIFICE - 3 [ ]

CALIBRATON _____ l/s to _____ l/s

TYPE OF OURDOOR PRESSURE TAP SYSTEM USED FOUR WALL - 1 [ ] REMOTE - 2 X

DOES EQUIPMENT AUTOMATICALLY CALCULATE "CORRECTED DATA"? YES [X] NO [ ]

MEASURED DATA*				CORRECTED DATA	
ΔPm(Pa)	Fan Speed RPM or P(Pa)	Qm(L/S)	t(°C)	P(Pa)	Q(L/S)
				60	261
				50	215
				40	193
				30	162
				20	99
				10	46

ΔPO= _____ (Beginning of Test) ΔPO= _____ (End of Test)

* Note: Readings must be taken at 6 points, at a minimum of 5 Pa intervals, and within the range of 10 Pa to 60Pa. When equipment automatically calculates "Corrected Data" the "Measured Data" section need not be completed if the calculation method is separately filed and verified with the listing agency by The Testing Company.

243 Primrose Drive
Home Address

St Albert Alta
City Province

R-2000 House No. _____

DATE OF TEST: May 25/89 TIME OF TEST: 11:00 AM

OUTDOOR TEMPERATURE: 18°C

BAROMETRIC PRESSURE: 936

WINDSPEED: Calm DIRECTION: VARIABILITY:

BUILDING VOLUME (Including basement) m^3 443.0

BUILDING ENVELOPE AREA (including basement) (from Hot-2000 data sheet) (for Normalized Leakage Area) m^2 349.0

TYPE OF HOME (bungalow, two storey, etc.)

SPECIAL FEATURES (cathedral ceilings, etc.)

CALCULATED DATA

C .605 L/(s X Pa)

n .951 (between 0.5 and 1.0)

r .992 (greater than 0.99)

Q_{10} _____ (L/s)

Q_{50} _____ (L/s)

_____ % Relative Standard Error of Q_{50} (less than 5%)

.020 NLA at 50 Pa.

1.88 Air Change ACH at 50 Pa. (less than 1.5)

I.I.C. Climatic Insulation Ltd.
Company name

2957-101 Street
Address

Edmonton, Alberta
City Province

Testing Firm No. _____

I hereby certify that this test has been performed in accordance with the R2000 Air Leakage Test Guidelines.

Len Schurman
Technician Name (print)

Signature _____

Date of this Report 89 July 26

Energy, Mines and Resources Canada / Energie, Mines et Ressources Canada

Form H310
86/03/01

Canada

JUL 2 5 1989

Standard Air Leakage Test Report

Canadian Home Builders' Association
Association canadienne des constructeurs d'habitations
R-2000

Builder/Company Name: Van-Vista Industries Ltd.
Address: 16315-113C Avenue
City: Edmonton Province: Alta.

Home Address: 8128 Mayfield Drive
City: Sherwood Province: Alta.
R-2000 House No.:

EQUIPMENT MANUFACTURER: Ener-Corp Inc.
TYPE OF EQUIPMENT: Infiltrometer

DATE OF TEST: July 19/89 TIME OF TEST: 13:00 AM
OUTDOOR TEMPERATURE: 28° C
BAROMETRIC PRESSURE: 94 kPa
WINDSPEED: Calm DIRECTION: VARIABILITY:
BUILDING VOLUME (including basement) m^3: 443.
BUILDING ENVELOPE AREA (including basement) (from Hot-2000 data sheet) (for Normalized Leakage Area) m^2: 341
TYPE OF HOME (bungalow, two storey, etc.):
SPECIAL FEATURES (cathedral ceilings, etc.):

FLOW MEASURING TECHNIQUE - NOZZLE - 1 [X] FAN SPEED - 2 [ ] ORIFICE - 3 [ ]

CALIBRATON ——— l/s to ——— l/s

TYPE OF OURDOOR PRESSURE TAP SYSTEM USED: FOUR WALL - 1 [ ] REMOTE - 2 [X]

DOES EQUIPMENT AUTOMATICALLY CALCULATE "CORRECTED DATA"? YES [X] NO [ ]

MEASURED DATA*				CORRECTED DATA	
ΔPm(Pa)	Fan Speed RPM or P(Pa)	Qm(L/S)	t(°C)	P(Pa)	Q(L/S)
				60	176.
				50	157
				40	124.
				30	101
				20	64.
				10	32.

CALCULATED DATA

C .003 L/(s X Pa)
n .964 (between 0.5 and 1.0)
r .998 (greater than 0.99)
Q_{10} ——— (L/s)
Q_{50} ——— (L/s)
——— % Relative Standard Error of Q_{50} (less than 5%)

ΔPO= ——— (Beginning of Test) ΔPO= ——— (End of Test)

* Note: Readings must be taken at 6 points, at a minimum of 5 Pa intervals, and within the range of 10 Pa to 60Pa. When equipment automatically calculates "Corrected Data" the "Measured Data" section need not be completed if the calculation method is separately filed and verified with the listing agency by The Testing Company.

.013 NLA at 50 Pa.

1.26 Air Change ACH at 50 Pa. (less than 1.5)

J.L. Climatic Insulation Ltd. I hereby certify that this test has been performed in accordance with the R2000 Air Leakage Test Guidelines.
Company name
2-9157-101 Street
Address
Edmonton, Alberta
City Province
Testing Firm No.:

Len Schurman
Technician Name (print)
Signature
Date of this Report: 19 July 89

Energy, Mines and Resources Canada / Energie, Mines et Ressources Canada

Form H310
86/03/01

Canada

howell·mayhew engineering, inc.

15006 · 103 AVENUE
EDMONTON · ALBERTA · T5P 0N8
(403) 484-0476

AIR LEAKAGE TEST REPORT

July 19, 1988

Name: CANCELL INDUSTRIES Address: #21 PINEVIEW DRIVE, ST. ALBERT

Technician: W. MAYHEW Project Name: NO POLYETHYLENE UNIT

Volume = 416.72 m³ Envelope = _____ m²

House pressure:
Initial = 0 Pa
Final = 0 Pa
Backgrnd = 0 Pa

Comments on the wind speed: CALM km/h
Barometric pressure = 94.80 kPa
Indoor air temperature = 19 °C
Outdoor air temperature = 17 °C

Reading #	Measured house pressure (Pa)	Corrected house pressure (Pa)	Fan pressure (Pa)	# holes plugged (-1=open)	Corrected Flow (cfm)	Maximum Error (must be < 6%) (%)
1.	50	50.0	70	4	506	1.6
2.	44	44.0	55	4	453	.1
3.	40	40.0	45	4	414	2.0
4.	35	35.0	37	4	379	1.1
5.	30	30.0	28	4	334	2.4
6.	25	25.0	23	4	305	2.1
7.	20	20.0	16	4	259	2.1

Air Leakage Test Results

C = 27.91 r = .997 (must be > 0.990)

n = .736 (between 0.5 and 1.0) RSE_{10} = 3.7% (must be < 7%)

Q_{50} = 498 cfm Air $change_{50}$ = 2.03 per hour

Q_{10} = 152 cfm Equivalent leakage area = 45 in² at 10 Pa

Comments: (Major leakage sites, recommendations...)

This side of the duplex is constructed without polyethylene.

The house volume was calculated by HME from the plans.

howell·mayhew engineering, inc.

15006 · 103 AVENUE
EDMONTON · ALBERTA · T5P 0N8
(403) 484-0478

AIR LEAKAGE TEST REPORT May 25, 1989

Name: CANCELL INDUSTRIES Address: #21 PINEVIEW DRIVE, ST. ALBERT

Technician: R. THRALL Project Name: NO POLYETHYLENE UNIT

Volume = 416.72 m³ Envelope = _____ m²

House pressures:
Initial = 0 Pa
Final = 0 Pa
Backgrnd = 0 Pa

Comments on the wind speed: CALM km/h
Barometric pressure = 93.60 kPa
Indoor air temperature = 21 °C
Outdoor air temperature = 14 °C

Reading #	Measured house pressure (Pa)	Corrected house pressure (Pa)	Fan pressure (Pa)	# holes plugged (-1=open)	Corrected Flow (cfm)	Maximum Error (must be < 6%) (%)
1.	60	60.0	170	4	751	1.3
2.	50	50.0	117	4	634	1.6
3.	40	40.0	80	4	533	1.7
4.	30	30.0	53	4	442	1.7
5.	20	20.0	26	4	320	.6
6.	10	10.0	8	4	188	.4
7.	0	.0	0	0	0	#DIV/0!

Air Leakage Test Results

C = 31.79 r = .999 (must be > 0.990)

n = .769 (between 0.5 and 1.0) RSE_{10} = 2.6% (must be < 7%)

Q_{50} = 644 cfm Air change$_{50}$ = 2.63 per hour

Q_{10} = 187 cfm Equivalent leakage area = 55 in² at 10 Pa

Comments: (Major leakage sites, recommendations...)

This side of the duplex is constructed without polyethylene.

The house volume was calculated by HME from the plans.

APPENDIX C:
Consulting Engineer
Report

Building Envelope Engineering
Inspection, Testing and Consulting Services

WOOD MOISTURE CONTENT MONITORING OF WET BLOWN CELLULOSE INSULATED WALLS

Prepared for:

Can-Cell Industries Inc.
16355 - 130 Avenue
Edmonton, Alberta
T5V 1K5

Attention: Mr. Ken Manning

Prepared by:

Building Envelope Engineering
Calgary, Alberta

John A. Vlooswyk, P.Eng.

July 26, 1989

J-030A2

1.0 INTRODUCTION

The purpose of this test program was to determine the rate of drying of residential stud wall components when insulated with wet-sprayed cellulose. In addition, drying rates were compared between wall sections with and without a polyethylene vapour retarder installed.

Cellulose insulation is a fibrous material that may be spray applied into the cavity to be insulated. Current uses in western Canada primarily involve this material in dry application methods on horizontal surfaces such as attics or as an acoustical insulation between residences. Wet sprayed cellulose involves mixing dry cellulose insulation with a binder during the manufacturing process. A water mist is added to the insulation as it is blown into the cavity, activating the binder and causing the material to form a cohesive set in the cavity. The rate of drying of the wall components as a result of this additional cellulose moisture was evaluated by this program.

The test program consisted of installing sensors, in a typical residence, to manually record wood moisture contents on a periodic basis. Installation of cellulose was observed in the area of the sensors and samples were obtained for moisture and density testing. As requested, for the initial two months, sensors were monitored on a 2 to 3 week basis, while subsequent readings were taken on roughly a monthly basis. One year after installation, the test wall was opened and examined for evidence of deterioration related to moisture or settlement of the cellulose.

2.0 HOUSE CONSTRUCTION

The test house is located in St. Albert, Alberta. It is a two-storey side-by-side duplex facing approximately south in a residential neighborhood.

The building was completed with typical residential 2x6 wood framed construction techniques. Gaskets were installed on the sill plates, window perimeters were sealed with a Poly-Air-Dam system and air exchangers were installed in each residence. Wall sections consist of: gypsum board, 2 mil polyethylene vapour retarder on the west half of the duplex, 38x140 mm Standard-Dry spruce studs on 400 mm centers, sprayed cellulose insulation, 10 mm wafer-board sheathing, building paper, and vinyl siding. Walls were finished with one coat Latex sealer and two coats Alkyd paint.

Ceiling space was insulated with a dry blown cellulose, while the walls and rim joists were sprayed with a wet-sprayed cellulose, supplied and installed by Can-Cell Industries of Edmonton.

Through a brief inspection, we observed that both halves of the duplex appeared to be constructed similarly, with the exception of the polyethylene vapour retarder, which was not installed in the east half.

3.0 MONITORING PROGRAM

3.1 DAY COUNT

The following schedule and corresponding day count developed for this program:

Day 0 - May 17/88 - Sensors installed and initial readings recorded.
Day 1 - May 18/88 - Cellulose insulation installed in walls and rim joists.
Day 2 - May 19/88 - Gypsum board installed at sensor locations (as reported by Can-Cell).
Day 107 - Sept 1/88 - Residences occupied.
Day 233 - Jan 5/89 - Attic cellulose moisture tests.
Day 373 - May 25/89 - Wall test cavities visually examined.

3.2 MONITORING STATIONS

Two monitoring stations were established in adjacent wall cavities of the main floor north wall in each residence. Each monitoring station consisted of moisture and temperature probes in the sill plate, wall stud, gypsum board and exterior sheathing. At each station, probes in the wall stud, gypsum board and sheathing, were set at 1200 mm above the sill plate stud. Probes were centered on the stud or in the cavity. Penetrations through the studs were sealed to isolate cavities.

Sensors located in adjacent stud spaces of the same residence are grouped, such as sensors 1-4 were in one stud cavity, while 5-8 were in an adjacent cavity.

Moisture probes were constructed of insulated metal pins and a plastic molded cap section which secured the pins at a 25 mm width while sealing wire connections from moisture. Pins were installed to a depth of approximately 9 mm in a direction parallel to the grain.

Temperatures were recorded adjacent to each moisture probe to facilitate temperature corrections. Thermocouples were utilized, embedded into the wood at a depth of 9 mm and along the same isotherm as the moisture probes.

Wood moisture contents were recorded to 1% with a Delhmorst Wood Moisture Meter while temperatures were recorded to 0.5 degrees Centigrade.

3.3 MATERIALS TESTS

During the spraying application of the north wall, samples of the sprayed cellulose were collected for materials testing purposes.

Density samples were obtained by spraying the material into a confined portable cavity, utilizing similar spray patterns to the wall sections. Moisture contents were determined based on original sample weight (wet basis), while density is presented in kilograms per cubic meter. Materials test results are as follows:

Sampling Date	Location	Density	Moisture Content
May 18/88	North wall	52	56%
		52	57%
		49	57%
	Average	51	57%

According to the manufacturers literature, cellulose should be spray applied at a density of 48 kg/cubic meter ± 5 and a moisture content of 50% $\pm$ 10. Based on the test samples, the material was applied within manufacturers recommendations in terms of density and moisture content.

Moisture contents of cellulose in the attic was tested on January 5, 1989. This cellulose had been dry blown into the attic space. Average moisture contents determined were 7% for both sides of the duplex.

3.4 WOOD MOISTURE CONTENTS

Wood moisture contents recorded are presented by Table 1, attached. Moisture contents are corrected for temperature, wood species and sensor calibrations. Temperature corrections are based on formulas developed by Mr. Van Rijn and Mr. Pouyez of Foreintek Canada. Gypsum board and waferboard sheathing moisture contents are based on wood moisture contents as recorded by the test equipment. Calibrations were not completed for these materials. Our purpose was to determine the drying rate or time required to dry the materials to pre-cellulose conditions. Maximum moisture contents were not required.

Wood moisture contents were randomly tested throughout the duplex prior to cellulose application. Average moisture content of the studs was 12%, sill plates 14% and sheathing 9%. The materials chosen for monitoring were representative of the average moisture contents for the dwellings.

Figures 1 and 2, present plots of the averaged wood moisture content vs. time. Figure 1 represents moisture contents recorded for the wall without a polyethylene vapour retarder, while Figure 2 illustrates the wall with polyethylene.

Data presented for May 17, 1988 represents wood moisture contents prior to application of the cellulose. Initial moisture contents of the gypsum board were not obtained due to the board not being installed at the time of our initial tests. Gypsum board moisture contents would have been initially affected by the taping and finishing procedures.

Substantial wind driven rain was experienced by the building between June 22 and July 7, 1988 (Days 36 to 51). Rain water seepage through the test walls and onto the flooring was noted during our testing of July 19, 1988. The test data indicates that sensors #18, #19, #20, #23 and #24 were directly affected by the penetrating rainfall. Each of the components of the wall with the polyethylene installed, absorbed additional moisture which affected the overall drying characteristics.

Steady-state readings were occasionally difficult to record from the gypsum board sensors in walls with polyethylene. Excessive moisture may have shorted the terminals. These readings were left blank on Table 1.

4.0 DISCUSSION

Unfortunately, the penetrating rain significantly affected the moisture loss characteristics of the test walls with polyethylene installed. The curves would not be indicative of typical drying characteristics, as a secondary moisture gain was indicated between 40 and 80 days. Limited comparisons between polyethylene and no polyethylene can be made. The rate of drying between 50 and 320 days was prolonged by the additional moisture. In addition, moisture was allowed to dissipate to the exterior only, due to the polyethylene vapour retarder restricting the rate of drying to the interior for this test section. Approximately 320 days were required to dry this wall to an equivalent level with the other wall.

The test data suggests the following drying characteristics for the walls sprayed with cellulose:

- Each of the wall components monitored, indicated sharp gains in moisture within 30 days of cellulose application.

- Walls without polyethylene, indicated a majority of the moisture .was released from the wall within the following

30 days. A gradual further reduction in moisture content occurred over the remaining period. By 240 days, each of the components, except for the sheathing, were within 2% moisture content of their pre-cellulose levels.

- Waferboard sheathing required the greatest length of time to dry. After one year, the sheathing indicated moisture contents 7% above the pre-cellulose installation levels.

5.0 EXAMINATION OF TEST WALL CAVITIES

On May 25, 1989, four sections of the exterior wall were examined for evidence of moisture related deterioration or settlement of the cellulose, two from each half of the duplex. The sections examined were approximately 400 mm square, removed from test walls of the residence.

Of the four locations examined, there was no evidence of fungi, wood rot or other deterioration of the wood due to moisture. Fasteners removed from the polyethylene walls displayed limited surface corrosion, sufficient to remove the galvanized coating. Of the fasteners removed, pitting was not visible.

Interior gypsum board appeared normal. There was no indication of settlement of the cellulose at the two headers examined.

6.0 CONCLUSIONS

This program evaluated the drying characteristics of wet-sprayed cellulose insulation in a typical residential duplex in St. Albert, Alberta. In addition, an attempt was made to compare drying rates between walls with and without a polyethylene vapour retarder installed.

The duplex was constructed of typical 2x6 wood framing techniques. Initial stud wood moisture contents were in the 12 to 14% range while the wafer-board sheathing was at 9%. Walls were wet-sprayed with cellulose insulation, supplied and installed by Can-Cell Industries Ltd.. Materials tests indicated the cellulose was installed within manufacturers recommendations in terms of density and moisture content. Wood moisture pins were installed within four wall cavities and periodically monitored.

The test program determined that the wall components gained moisture over the initial 30 days, however, a majority of this moisture was again released within the following thirty days. Wall component moisture contents were within 2% of their pre-cellulose installation levels after 240 days, with the exception of the exterior sheathing. The sheathing remained approximately 7% above original conditions after one year.

Accurate comparison between wall sections with and without a polyethylene vapour retarder could not be made due to rain water penetration into the wall cavity, during the program.

Dry-blown insulation in the attic was relatively dry when tested, eight months after installation

Inspection of four sections of the test wall cavities, one year after construction, noted no significant evidence of moisture related deterioration. Limited surface corrosion was observed on sheathing fasteners removed from the wall with polyethylene installed. There was no indication of settlement of the cellulose. Interior gypsum board finish appeared normal in both residences.

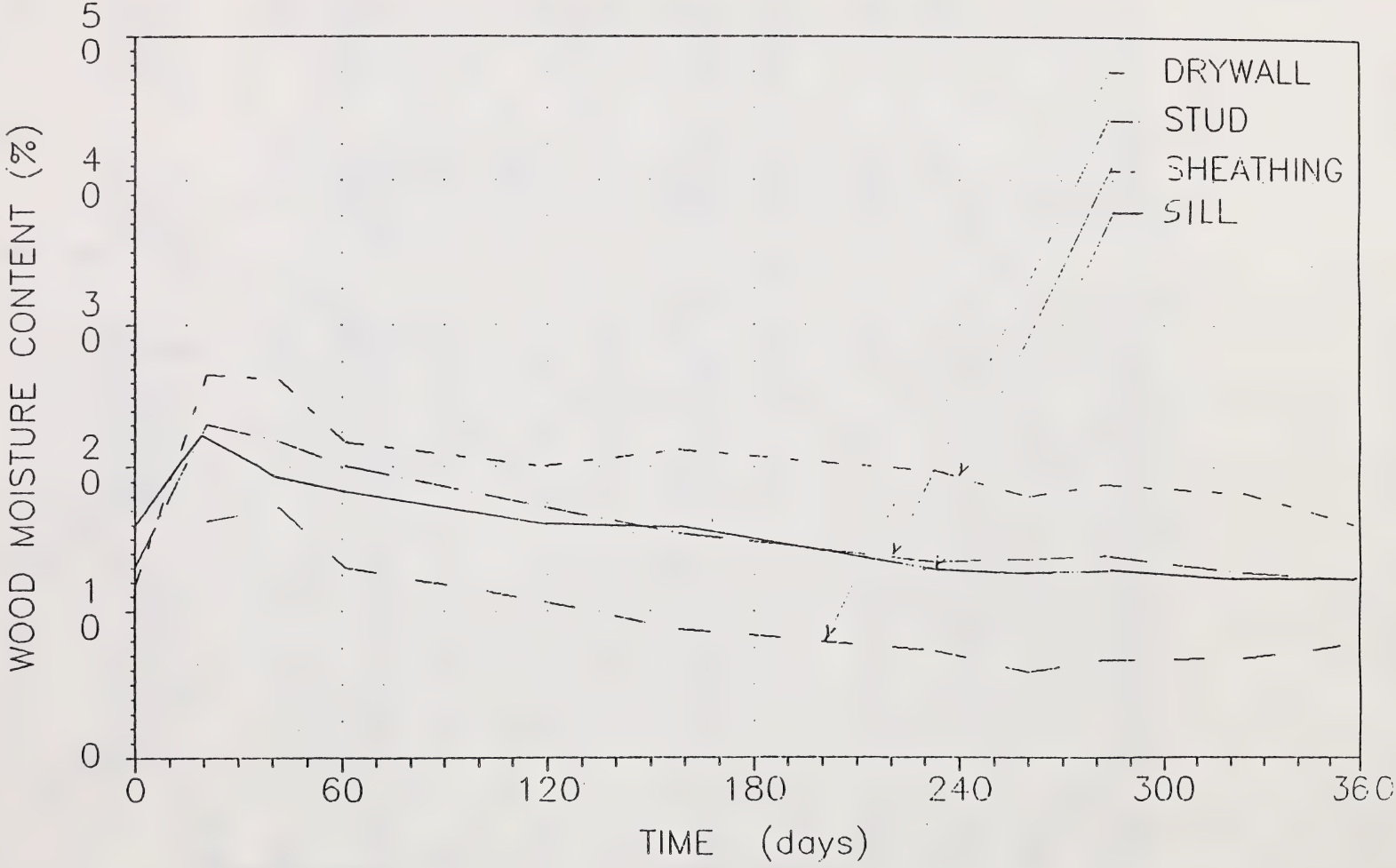
TABLE 1
CAN-CELL CELLULOSE INSULATION
WOOD MOISTURE CONTENTS (%)

	DATE	88/05/17	88/05/08	88/06/30	88/07/19	88/09/15	88/10/24	89/01/05	89/02/09	89/03/03	89/04/14	89/05/25
	TIME	19:00	14:00	14:00	11:00	13:00	14:00	9:00	11:30	15:00	12:30	13.0
	DAYS	0	21	42	61	119	158	233	260	282	324	373
WITHOUT POLY												
1	Drywall		17.2	17.5	17.0	9.8	9.2	7.1	6.0	6.5	6.5	6.7
2	Stud	13.0	20.7	20.6	20.2	16.9	14.5	12.5	14.1	13.7	12.8	12.2
3	Sheathing	11.7	27.8	27.1	23.2	19.7	21.1	19.2	17.2	17.8	17.1	15.1
4	Sill	16.1	21.0	19.3	19.1	15.7	16.1	14.5	14.0	13.3	13.0	12.9
5	Drywall		15.3	16.9	9.0	11.5	8.4	7.5	5.6	6.8	7.1	9.0
6	Stud	13.1	25.4	23.1	20.0	17.5	16.3	14.2	13.0	13.9	12.5	12.2
7	Sheathing	11.8	25.4	25.4	20.3	20.4	21.3	20.2	18.7	19.8	19.3	16.8
8	Sill	15.6	23.8	20.3	17.9	16.9	16.1	12.7	12.6	13.6	12.3	12.8
WITH POLY												
17	Drywall		16.6	12.7	17.9	15.5	8.6	9.7			7.6	9.1
18	Stud	14.1	46.3	13.6	56.4	44.0	21.6	14.7	13.3	14.0	12.5	13.0
19	Sheathing	11.5	25.4	14.0	27.1	27.5	29.3	24.1	18.7	20.1	17.2	15.1
20	Sill	15.0	32.2	18.0	27.4	22.4	20.3	15.3	13.8	13.2	12.8	12.2
21	Drywall		16.4	13.3	17.9	14.5	7.4	8.5			7.2	7.0
22	Stud	13.1	44.0	19.0	13.9	13.7	22.7	14.3	12.7	13.4	13.3	13.6
23	Sheathing	10.8	27.6	19.6	28.7	28.3	30.1	26.7	26.5	26.0	16.7	15.5
24	Sill	14.9	24.3	18.9	24.7	21.3	19.3	15.0	14.6	14.4	14.4	13.6
AVG. WITHOUT POLY												
	Drywall		16.3	17.2	13.0	10.7	8.8	7.3	5.8	6.7	6.8	7.9
	Stud	13.1	23.1	21.8	20.1	17.2	15.4	13.4	13.6	13.8	12.6	12.2
	Sheathing	11.8	26.6	26.2	21.7	20.1	21.2	19.7	18.0	18.8	18.2	15.9
	Sill	15.9	22.4	19.8	18.5	16.3	16.1	13.6	13.3	13.5	12.7	12.8
AVG. WITH POLY												
	Drywall		16.5	13.0	17.9	15.0	8.0	9.1			7.4	8.1
	Stud	13.6	45.2	16.3	35.1	28.8	22.2	14.5	13.0	13.7	12.9	13.3
	Sheathing	11.2	26.5	16.8	27.9	27.9	29.7	25.4	22.6	23.0	16.9	15.3
	Sill	14.9	28.3	18.5	26.0	21.9	19.8	15.1	14.2	13.8	13.6	12.9

FIGURE 1

CAN-CELL CELLULOSE INSULATION

POLY VAPOUR RETARDER NOT INSTALLED



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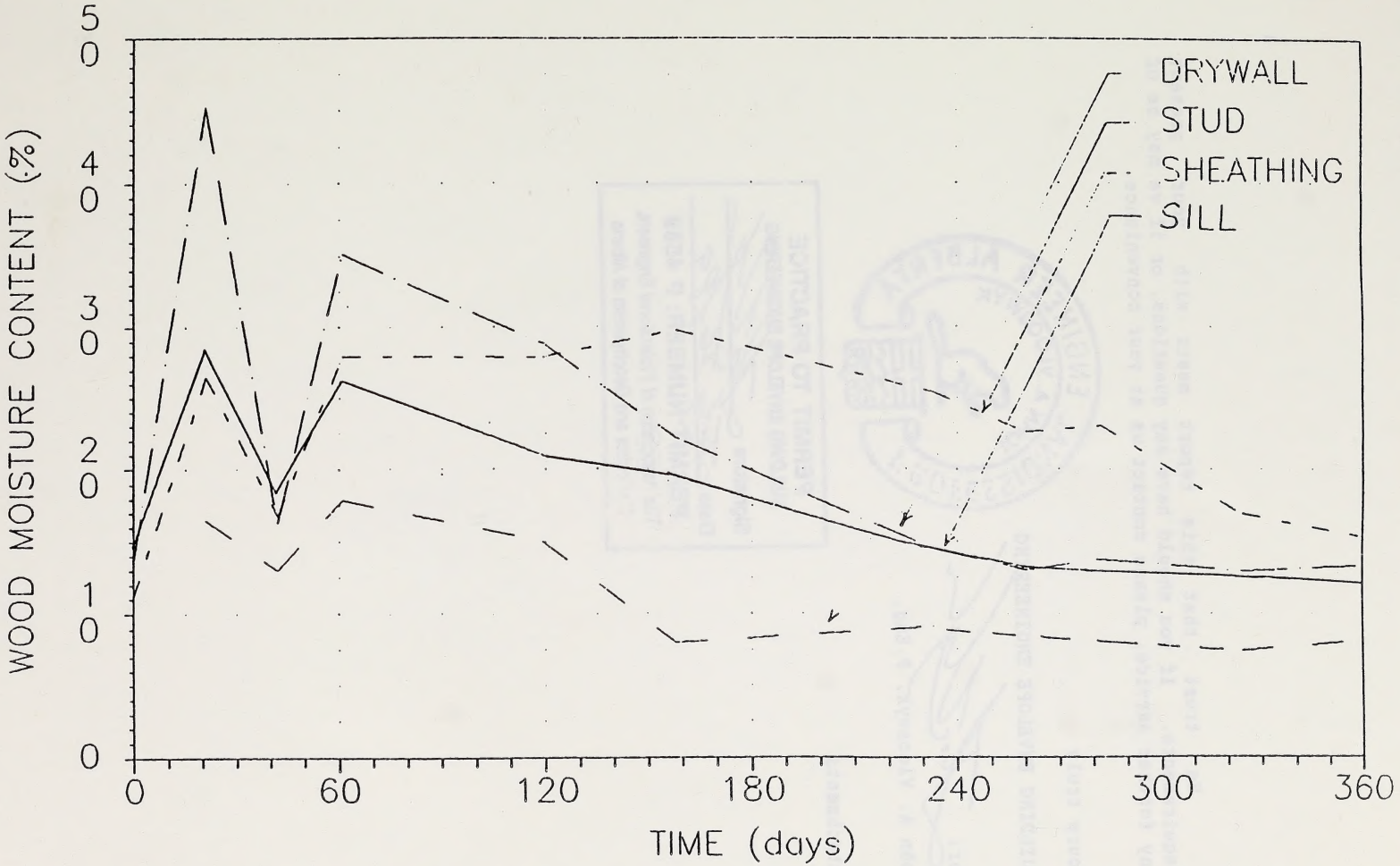
NOTE: POINT IN TIME MEASUREMENTS

FIGURE 2

CAN-CELL CELLULOSE INSULATION

POLY VAPOUR RETARDER INSTALLED



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We trust that this report meets with your present requirements. If you should have any questions, or if we may be of any further service, please contact us at your convenience.

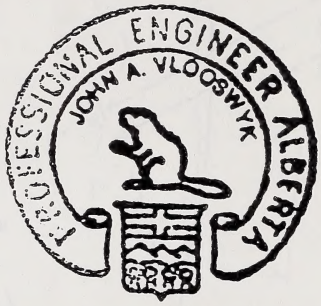
Yours truly

BUILDING ENVELOPE ENGINEERING

Per:

John A. Vlooswyk, P.Eng.

attachments



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